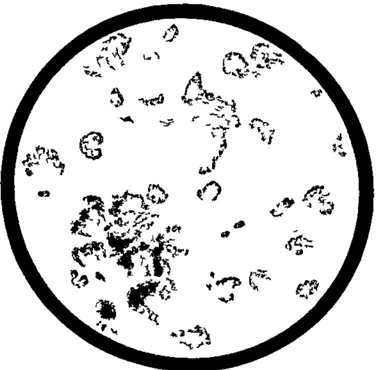
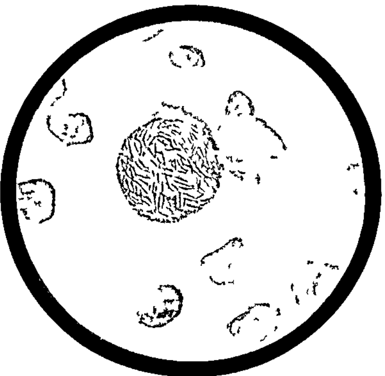


MYCOBACTERIUM LEPRAE SHOWING INTRACELLULAR FORMS



MYCOBACTERIU I LEPRAE SHOWING LARGE GLOBUS IN THE LIVER OF A MONKEY

OXFORD MEDICAL PUBLICATIONS

# A PRACTICAL TEXTBOOK OF LEPROSY

BY

R G COCHRANE

M D Ch B (Glas ) F R C P (Lond ) D T M & H (Eng )

MEDICAL SECRETARY M SION TO LEPERS
PRINCIPAL MI SION RY MEDICAL COLLEGE V LLORE S INDIA
HON DIRECTOR LEPROSY CAM AIGN AND HON DI ECTOR LEPROSY
RE E RCH MADRA PRE IDENCY HON PHY ICIAN IN CH RGE OF
LEP OSY D PARTMENTS GENERAL AND STANLEY HOS ITALS MADRAS
LATELY HIEF MEDICAL OFFICE LADY WILLINGDON LEP OSY
SANATORIUM CHINGLEPU S INDIA

WITH A FOREWORD BY

GEORGE R McROBERTS

CIE MD FRCP DTM & H Lt Col IMS

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THIS BOOK IS DEDICATED

TO MY WIFE

BUT FOR WHOSE ENCOURAGEMENT IT WOULD
NEVER HAVE BEEN ATTEMPTED AND WITH
OUT WHOSE PERSISTENCE WHEN ENERGY
WAS FLAGGING AND ENTHUSIASM WANING
IT WOULD NOT HAVE BEEN COMPLETED

# FOREWORD

By

GEORGE P McROBERT CIE MD FPCP DTM & H Lt Col IMS

Lately Professor of Medicine Madras Medical College

Physician Superintendent General Hospital Madras

Amongst qualified medical men more misconceptions exist about leprosy than about any other disease

Doctors arriving in the tropics for the first time generally believe that leprosy is a loathsome disease easily recognisable but amenable to treatment and often cured by modern therapy

On the other hand those trained in medical schools in the tropics too often take an utterly pessimistic view of the malady They know that diagnosis is frequently difficult and treatment often futile but they have not yet grasped the importance of assessment of the type of leprosy present nor have they recognised the benign and self healing nature of some forms of the disease

The facts are that certain cases of leprosy become cured without any treatment what soever whilst others go from bad to worse despite our best endeavours A fair proportion of persons infected with leprosy look perfectly normal such lesions as are present can sometimes be detected only by a trained expert and a number of such apparently healthy persons are infective

Too much success has been claimed for chaulmoogra oil and its derivatives and irresponsible optimism with regard to their value has deflected attention from the acute need for more active search for effective chemotherapeutic weapons

Dr Cochrane s experience as a teacher of post graduates and under graduate as a field worker and as a researcher in the wards and laboratory in different parts of the world amongst races of differing susceptibility enables him to write on this difficult subject with authority

His balanced and eminently sensible views on the whole problem of leprosy are worthy of the closest attention

# PREFACE

It has been felt for a considerable time that a practical textbook on leprosy would fill a gap between the type of book which deals largely with the theoretical aspects of the subject and the smaller pamphlets It was after much persuasion this work was written and it is hoped that it will be of help to practitioners in the tropics medical officers in charge of institutions as well as to the specialist

An attempt has been made to view the subject in a comprehensive manner so that the preventive worker as well as the doctor dealing with the curative side of leprosy will find help

It is difficult to acknowledge all the friends who have encouraged me in this task To Colonel McRobert who for many years has been pressing me to write this book I owe a debt of gratitude for help and inspiration To my own colleagues in the Lady Willingdon Leprosy Sanatorium I am deeply mindful of all their encouragement and of their varying and long experience which they have placed at my disposal I have to thank Dr Herbert Gass Medical Superintendent of the Claire Leprosy Hospital Chandkuri Central Provinces for help in the chapters dealing with the surgical aspects of the subject To Dr Donald Dow lately Medical Superintendent of the Leprosy Hospital Dichapli Hyderabad Deccan who was good enough to help in the preparation of the chapters dealing with Electrotherapy and the organisation and management of a leprosy sanatorium I would express my appreciation

I should like particularly to express my thanks to Messrs Vale & Co of the Bangalore Photo Store for their help in preparing the prints from my negatives and for their ready assistance at all times especially during six years of war B N Privett Esq has given considerable technical advice in the preparation of the photo micrographs and has loaned several illustrations Dr Alistair Macleish of the Friends Ambulance Unit and Dr Norman Macpherson and Dr Edward Gault of Vellore have given useful and constructive criticism

I am particularly grateful to my wife for helping with the preparation of the manuscript for the press and for the many hours of labour which she has put into the production

To Dr Kate Young who generously volunteered to undertake the difficult work of preparing the index and with so little time in which to complete her task no words of mine can adequately convey my thanks and appreciation

My publishers have shown that courtesy and appreciation of an author s difficulties which is characteristic of the Oxford University Press

P G C

1947

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CHAPTER I

# INTRODUCTION

## (a) Modern Outlook towards Leprosy

It is with some hesitation that this book has been prepared but perhaps nowhere in the world is a greater wealth of clinical material available than in the Madras Presidency where during the last ten years there has been a unique opportunity to study the practical aspects of leprosy at the Lady Willingdon Leprosy Sanatorium Chingleput and its associated clinics In addition the author has a choice of over two thousand clinical photographs and over 700 skin sections from which to illustrate his text This with an experience of over twenty years justifies we feel the publishing of a textbook on leprosy which deals with the subject along essentially practical lines The modern physician in the tropics is anxious to be acquainted with the disease as he is likely to see it in everyday practice and desires clear guidance with regard to the management of a case of leprosy and how to deal with its complications This book is an attempt to meet this need It has for the past ten or more years been impressed on us that there is no book which deals with leprosy both from the point of view of the practitioner in the tropics who inevitably must treat cases of leprosy as well as the doctor who finds that one of his duties is the care and management of a leprosy institution While this is essentially a practical book it is hoped that it will also be of use to the medical man who is specialising in leprosy and that it will encourage others to take up this work as a speciality for not until more medical men are willing to devote their lives to the elucidation of this in some ways the world s most baffling disease will real progress be made

It is only within the last four years that leprosy has been considered of sufficient importance in the Madras Presidency to warrant the organisation of special leprosy departments in the teaching hospitals and it is hardly necessary to remind readers that even to day very few medical men have more than a nodding acquaintance with a disease which has puzzled mankind from the time of Hippocrates up to the present day While this is still the case it is to be admitted that within recent years a great deal of interest in leprosy has been aroused Thi has been largely due to the labours of Rogers and Muir followed later by Lowe Santra and Dhamendra in India Mercado and Heiser followed by Wade Lara and Rodriguez in the Philippines Mitsuda Hayashi and his colleagues in Japan and Lampie in the Dutch East Indies Ryrie in Malaya and Rose in British Guiana and Robello and others in South America The work of these pioneers is now bearing fruit and at long last leprosy is beginning to be viewed not solely as a social problem but primarily as a medical and preventive one

It may be explained at this point that it is impossible always to state the source from which information has been gleaned for in an experience of over twenty years and with the privilege of having had contact with workers throughout the world lessons have been learnt and opinions fashioned into one s own thinking in such a way that it is very difficult to remember accurately the source of the original inspiration and

hence if there have been omissions in this direction it is hoped that they will be over looked I should however be lacking in courtesy if I did not express a deep sense of gratitude to all workers wherever they are who have shared with me their knowledge especially to Dr E Muir Dr Wade Dr Lowe and Dr Ryrie whose friendship and guidance have widened my vision and increased my understanding

Finally a book of this nature could not be written if it were not for the enthusiastic band of assistants It would be impossible to name all those who have by their co operation and loyalty given the writer the opportunity for wider and more concentrated study but one would be wanting in gratitude if mention were not made of the doctors nursing sisters compounders technicians and hospital assistants in the Lady Willingdon Leprosy Sanatorium and its associated clinics and Investigation Units who by their loyalty and devotion to duty enabled information to be collected which would otherwise have been impossible to secure

It cannot be too strongly emphasised that in order to view leprosy aright one s whole attitude towards the disease must be altered Everyone who commences leprosy work has to overcome to a lesser or greater extent an inborn fear of the disease this fear has been engendered through traditional beliefs which have been passed down throughout the ages and which appear to be common to all nations and peoples where leprosy has been in existence from time immemorial It is not only the lay public who shun those suffering from leprosy but many medical men think that this disease is outside their province and show in the presence of those suffering from leprosy quite an unwarranted fear This fear is usually directed against the more obvious sufferer while the less obviously afflicted and frequently more infective person is allowed to mix with the public without let or hindrance If one is to succeed in leprosy work one must adopt an attitude of friendliness even though at times stern action is in evitable Behind all one s acts the sufferer from leprosy should feel that it is realised that he is a human being with a human personality and a human soul and not a person to be shunned Therefore such words as leper clean untainted should find no part in one s vocabulary because they indicate a conception which belongs to the Middle Ages

It is interesting to note in this connection that special nouns have been used largely for diseases with a social stigma e g syphilitic lunatic consumptive leper Not until the medical profession ceased to call those who were mentally afflicted lunatics and those who had tuberculosis consumptives did a fresh outlook arise It is believed therefore that if the medical profession would refuse to refer to people with leprosy as lepers then a saner attitude towards this disease would arise and those with leprosy would no longer be shunned unnecessarily and outcasted from the community with little hope of ever being re established even though their disease in many instances is innocuous or when they have been rendered free from infection

It has been frequently asked if there is no need to be fearful concerning leprosy —what is the explanation of the widespread dread of the disease? In European countries this dread can be traced to the attitude adopted as the result of measures taken against leprosy in Biblical times It should here be explained that what is described as leprosy in the Bible is I believe a generic name for a group of diseases Some authorities doubt the existence of true leprosy in the Old Testament times The health laws of the ancient people of Israel are among the most perfect in the world Because the people of Israel were firmly convinced that they were a chosen people

separated unto the Lord nothing with a permanent blemish was permitted within the camp Therefore all mutilating all infective all unsightly conditions were placed without the camp When the word zaraath which probably covered a large number of diseases was translated it was referred to as leprosy Hence a sense of horror was attached to the name and a disease which does not deserve the opprobrium showered upon it became synonymous with something which conveyed a sense of fear dread and horror It is hoped that this book will help to dispel the traditional repugnance which surrounds leprosy and will enable medical men to look upon leprosy as an ordinary disease and encourage them to take the same interest in it as they would in any of the many other diseases they are called upon to treat and prevent To day leprosy is still viewed with a terror and dread by persons in countries where the disease is prevalent The reason for this is most likely to be found in the fact that legends with regard to leprosy are lost in the mists of time and also in the fact that a proportion of cases small compared with the numbers who acquire the disease become mutilated and in these cases the ravages wrought by the disease have been graphically depicted in text books and novels all down the ages This has resulted in an unreasoned prejudice against the disease which is difficult to eradicate from our minds

**(b) History of Leprosy and its Spread throughout the World**

A French authority stated very truthfully that leprosy is a disease as old as the world itself

Tradition has it that the cradle of leprosy is to be found in the upper reaches of the Nile and there are Egyptian records dating from 1350 B C which refer to leprosy among Negro slaves from the Sudan and Dafur This is interesting in view of the high rates of leprosy at present in Central Africa Some authorities suggest that leprosy spread throughout the world from Africa by way of the trade routes and possibly from East Africa across to India by sea There is considerable evidence to indicate that leprosy spread from Africa to Egypt Asia Minor and Europe Leprosy however has been known in China for many centuries and it is impossible now to trace its origin and therefore it can only be surmised that it was introduced from Africa via India It is known that leprosy has been prevalent in the provinces contiguous to Tibet and Burma (e g Yunnan and Kansu) for centuries and this lends some support to its introduction via ancient trade routes It is also known that in fairly recent times leprosy spread from China to Malaya the Malayan archipelago the Pacific islands and Australia Leprosy in Japan was almost certainly introduced from China There are records relating to the spread of leprosy to Europe through Greece about 350 B C brought probably by the armies of Darius while those of Pompey carried it to Rome in 62 B C Galen mentions it in Germany in A D 180 and it had spread all over western Europe by the ninth century This is of interest because there is a widespread belief that leprosy was introduced into Europe by the return of the Crusaders It is said that leprosy increased during the eleventh to thirteenth centuries but the disease appeared in Europe many years before this

The study of the rise fall and subsequent disappearance of leprosy in England is of interest to all students of leprosy The first known leprosy hospital in England was established in Nottingham between A D 625 and A D 638 in Ireland in A D 809 and Wales in A D 950 Leprosy was apparently not prevalent in Scotland till the fourteenth century By the latter part of the fourteenth century the disease had

begun to die out in England and had nearly disappeared by the end of the sixteenth century a Royal Commission reporting that most of the lazaar houses were by then empty Many cases still persisted in Scotland however and the disease remained endemic in Ireland up to 1778 and in the Shetland Islands up to 1798

The reasons for the decline of leprosy in England are of interest and various causes have been suggested Leprosy existed in the British Isles between A D 638 and A D 1798 but it had practically died out of England by the end of the fifteenth century at a time when the diet of the people had changed from black bread and salt fish to vegetables and fresh meat The Black Death in A D 1340 must have carried away many sufferers from leprosy While the awakening of a public health conscience and better standards of living undoubtedly played an important part in the elimination of leprosy it is felt however that the strict laws of segregation whereby the sufferer was not allowed to come into contact with healthy persons (especially children) were the main factors in controlling the disease The number of persons suffering from leprosy in England in the Middle Ages could never have reached the proportions of those with leprosy in the East for the total population of the British Isles must have been comparatively small and therefore there was a possibility that by rigid laws which in the majority of instances prevented close contact between infected and healthy persons the disease could be brought under control Priests must have had a fair knowledge of leprosy and the easier diagnosis in the light skin made the recognition of the disease simpler and probably only a small proportion were missed The strictness of the measures taken to prevent infection will be realised when it is stated that when a diagnosis of leprosy was made the funeral service was conducted over the infected patient the significance of which was to emphasise that he had died as far as the world was concerned After the service the priest addressed the individual in these words While you are diseased you will enter no house no inn no forge no mill nor in the fountain will you drink water or wash your clothes You will not eat except by yourself or with other lepers You will enter no church during service you will mingle with no crowd When you speak to anyone you will stand leeward You must always use your gloves and will touch no rope without them You will touch no child not even your own and you will return to your cabin every night

The epidemic of leprosy reached its height in Europe between A D 1000 and A D 1400 During this period it was stated that France had two thousand lazaar houses There were at this time 324 lazaar houses in Great Britain 283 in England 19 in Scotland 2 in Wales and 20 in Ireland It is felt that the greatest factor in the control of leprosy in the British Isles was through the rigid precautions which were taken reducing the chances of children becoming infected When the possibility of infecting these highly susceptible individuals was reduced to negligible proportions the disease died out of the country The Black Death the advancement of civilisation a public health conscience all played a part but it is believed a subsidiary part

At the same time as leprosy was dying out in the Old World it was introduced into the New first by Columbus s soldiers and much later by the slave trade from highly endemic areas in West Africa Areas of varying endemicity still remain in the less developed countries of Europe but owing to the reasons already stated the disease has been eliminated in the main both there and in the northern states of America except for cases imported from endemic areas

Various authorities have estimated the number of cases of leprosy in the world and in the various countries of the Empire but any figures given can only be guess work and until much more detailed information from surveys is available there seems little purpose in burdening the mind with such detail All that need be said is that the areas of highest incidence are found in West Africa India Burma South China Malayan archipelago and certain of the Pacific islands

Some idea of the vagueness of the figures will be realised when authorities estimate the incidence in India as between one and five per thousand of the population This may be so if averaged out but such a method gives no idea of the true state of the disease and in an affected presidency such as Madras there are villages with incidences of 40 60 and as high as 120 per thousand of the population It will be stressed later that incidences of 20 or even 30 per thousand may not be of serious import for it is not the number of cases that matter but the type and age distribution that is of serious moment The significance of all this as far as India is concerned will be explained later It is probably not an exaggeration to state that there may be as many as 300 000 cases of leprosy in the Madras Presidency alone Such a statement like this must however be viewed in its right perspective for many cases belong to the benign neural type and probably give rise to no trouble to the individual nor constitute a danger to the public Leprosy in rural areas and to a less extent in urban is essentially a sporadic disease as will be illustrated in the next chapter One village or group of village may have a high incidence and yet another village only a few furlongs or less away may have little or no leprosy The importance of such an observation in connection with the epidemiology and prevention of leprosy will be apparent later

CHAPTER II

# ETIOLOGY

## (a) Description of M Leprae

It is now generally accepted that the causative organism of leprosy is the myco bacterium leprae (M leprae) The bacillus was discovered by Dr Armaur Hansen and his results were first published in 1874 The bacillus belongs to the group of bacilli known as acid fast oragnisms and is readily stained with carbol fuchsin but is some what more easily decolourised with acid alcohol than the M tuberculosae (see frontis piece) The M leprae is seen as a uniformly stained rod straight or slightly curved varying in length from 1μ–8μ and in breadth from 0 2μ–0 45μ Variations of size and shape are frequently seen and the organism may show a fragmented appearance with unstained gaps The bacilli may be beaded and many may appear as acid fast granules it is this pleomorphic character of the bacilli that has caused considerable discussion as to the significance of these various forms The organisms in active cases are seen in characteristic clusters some refer to such clusters as cigar shape bundles In addition to the bundles of bacilli in certain advanced cases and more particularly in those races in which leprosy tends to develop more seriously and more rapidly—e g *Mongolian and European races the organisms are seen as global masses* These are clumps of bacteria enclosed in what appears to be a capsular material This character istic appearance was first described by Neisser who designated these as globi Denny (1934) described globi as disc lil e masses seemingly restrained by a limiting membrane within which the outermost rods are aligned somewhat concentrically There have been many explanations of this phenomenon some consider globi to be intracellular colonies others to be clumps of bacilli formed within lymph spaces and another view which Denny (1934) has put forward is that they may be characteristic colonies growing within an as yet unidentified restraining membrane The clumps of bacilli are bound together by a lipoid like substance called the gloea The cluster and under certain conditions the global masses are not only found scattered sometimes in enormous numbers throughout a slide but in the more active forms intracellular clusters and globi are also seen From the time the bacillus of leprosy was discovered until to day there have been numerous attempts at growing it on artificial media The present position is represented by the resolutions at the Cairo Conference (1938) on this subject which were as follows

## THE CULTIVATION OF THE LEPRAE BACILLUS

REPORT OF THE SUB COMMITTEE ON *IN VITRO* CULTIVATION OF M LEPRAE

### Majority Report

The majority of the sub committee appreciate that much work has been done on the artificial cultivation of Hansen s bacillus The fact that results reported by various individuals or groups of worl ers have not in the majority of instances been duplicated by others although many attempts have been made with this end in view leads to

the opinion that the problems of the *in vitro* growth of the causative agent of leprosy have not yet been solved satisfactorily The Committee highly commends the work of all who have laboured in this field and heartily recommends that research along this line be continued

(Signed) H I HASSELTINE (Chairman)
MALCOLM H SOULE
K F BIRKHAUG

**Minority Report**

It is the opinion of the undersigned that the causative organism of leprosy has been cultivated by Professor Kedrowsky and a few other research workers It is urged that investigators in this field be encouraged to continue in the furrow already ploughed and on the other hand to seek for new ways but always to carry on without pre conceived ideas about the strict acid fastness of the different bacterial forms occurring in leprosy material which are in my opinion only broken down stages of one and the same lower fungus

(Signed) JOHN REENSTIERNA

In a review (1939) on the bacteriology of leprosy the late Earl McKinley summarises the position by saying There does not exist to day any absolute proof that any investigator has actually succeeded in the artificial cultivation of the leprosy bacillus There is little doubt that the M leprae is a very lowly pathogen as witnessed by the fact that almost every experiment on humans has failed It is perhaps not realised that of some 145 attempts to infect man with leprous material there is no single record of a deliberate experimental human transmission which can be accepted as proved with the possible exception of that described by Arning (1889) There are instances where doctors have deliberately infected themselves without results It will be shown later that the adult is relatively non susceptible and probably only exceptionally acquires the disease

**(b) Animal Inoculation**

Although the M leprae was one of the earliest organisms discovered and the work of Armaur Hansen was followed by the equally brilliant work of Koch in the field of tuberculosis the fact remains that it is the one organism which has resisted culture on artificial media and every attempt to produce progressive disease in animal has up to now failed There is little purpose served in detailing the very numerous attempts at infecting animals with leprosy during the past fifty years or more but the latest work which was stimulated by the claim of Adler (1938) that the Syrian hamster was a susceptible animal deserves mention Following on this work and on a theory that a tuber of the *colocassia antiquorum* family was an etiological factor in leprosy Oberdoeffer and Collier claimed that they had infected monkeys by first feeding them on this tuber and then inoculating them with a nodule from an advanced case of leprosy In an attempt to confirm these and other claims animal inoculation work has been undertaken at the King Institute Guindy Madras for the past eight years Although in one instance marked dissemination of the organism resulted from splenectomising a monkey and inserting a nodule in the splenic stump no evidence has yet been forthcoming to indicate that we or anyone else have produced progressive disease In the monkey occasionally is seen a rapid multiplication of the bacillus in the skin of the

abdomen contiguous to the incision. This in one instance extended to ulceration over the whole abdomen. In addition to this bacilli were found in the mesenteric glands, liver and kidney, but the infection does not appear to establish itself, for apparently after a varying period the bacilli disappear and 3–9 *months later no trace of the* inoculated nodule remains.

On feeding with *colocassia antiquorum*, which must be ground up and the animal *fed by a pipette*, the monkey after some months becomes emaciated as a result of under-nourishment and an erythematous moist rash appears over the body, especially on the abdomen, in which acid fast bacilli are found. We are of opinion, however, *that these* bacilli are not M. leprae but an acid fast saprophyte, for occasionally a similar organism



Fig. 1.—Monkey showing lesion on forehead after inoculation and intradermal injection of lepromin.



Fig. —Same monkey showing enhancement of lepromin reaction after inoculation and daily injection of lepromin.

can be found in the skin of the ear of a normal animal. Experiments in the lepromin[1] reaction have also been inconclusive. In our experience all normal monkeys are negative, but on inoculation, sometimes after the first, at other times after repeated inoculation, the lepromin reaction becomes positive. In one monkey in our series in *which splenectomy was performed and a nodule fixed to the splenic stump then given* daily intradermal injections of lepromin, the reaction became so enhanced (see illustration) that haemorrhagic nodules were produced. When the experiment was repeated, enhancement of the reaction was noted, but the previous haemorrhagic nodules were not produced. In this animal, one year later, after a further course of *intradermal injections of* lepromin a lesion appeared on the forehead away from the injected area, in which tuberculoid changes were demonstrated. This lesion became prominent while injections were given, but subsided during intervals between the injections.

[1] Lepromin is a finely ground up saline emulsion of M. leprae; its method of manufacture and use *will* be described later.

our present state of knowledge it is difficult to assess the significance of these
ults This work definitely confirms the opinion that animals may show at times
semination of the M leprae in their tissues but all attempts at producing progressive
ease have so far failed In this connection McKinley (19 ) As for animal
perimentation we feel again that the only fair statement which can be made at the
esent time is that no investigator has yet succeeded in producing in an experimental
imal the counterpart of leprosy as it is known in man Mention might be made
other mycobacterial
eases in animals A
prosy like disease in
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an organism similar to
t leprosy being found in
e human tissues There
s been described within
cent years an acid fast
ganism in many re
ects very similar to the
leprae which infects
ttle but outside the
atch East Indies no



Fig 3 —Photom og pl f t n f n du l n fo et l of monkey lowing g t ll ( gn fi t 400)

amples of this disease have been seen Those interested in the subject are referred
an exhaustive review on mycobacterial disease published by Long *et al* (1938)

While it is known that the M leprae fulfils only one of Koch s postulates it can
found in the tissues of the body in every active case Few leprologists of repute
ubt that the causative organism of leprosy is the M leprae This infecting agent
wever seems to be very specialised and as yet is not known to live outside its normal
bitat the human tissues or to infect lower animals

In conclusion it may be stated that the position with regard to the M leprae being
e causative organism of leprosy has been well summarised by Black (1938) Absolute
entific proof that Hansen s bacillus is the sole etiologic agent awaits satisfactory
ltural methods and susceptible experimental animals However the constancy
th which this bacillus is found in the lesions and the failure to find other agents
akes its acceptance as the cause of leprosy almost universal

CHAPTER III

# EPIDEMIOLOGY

It has been pointed out by Stewart (1933) that diseases like leprosy and tuberculosis can be considered to be epidemic diseases behaving like other epidemic diseases rising to a peak and gradually declining. The curve of the epidemic cannot however be considered in terms of weeks or months but in terms of centuries. Thus viewed the epidemic of leprosy in the British Isles lasted from A D 600 to A D 1700 a period of eleven hundred years. The tuberculosis epidemic in England is declining. Some extremists consider that this is taking place in spite of increased knowledge of prevention and better methods of treatment. It is reasonable however to conclude that the more efficient the methods of control and the better the understanding of the disease the more likely are we to hasten the natural decline of epidemic diseases such as tuberculosis and leprosy.

A great deal has been written on the epidemiology of leprosy and many theories have been put forward on insufficient evidence. Because of the unreasonable dread of leprosy in the majority of communities it is unwise actively to encourage such attitudes by laying stress on epidemiological factors which are of academic importance but have little bearing in relation to the present knowledge of the disease. In studying the epidemiology of leprosy we shall endeavour to draw conclusions from facts which I believe cannot easily be refuted. All the evidence presented is largely the result of experience in South India over the last ten years. While I am aware that leprosy varies in certain important aspects in other parts of India and the world I believe that the basic facts which are put forward in this chapter stand wherever the disease is highly endemic. Further all tables and figures published are taken from the records of the Silver Jubilee Clinic for the study of Child Leprosy Saidapet Madras and from the Lady Willingdon Leprosy Sanatorium Chingleput Madras Presidency.

In discussing the epidemiology of leprosy there are factors which from the evidence available appear to be of overwhelming importance. There are other factors of less importance and some influences which we consider are of little or no import liable to confuse the picture and encourage the prevailing dread and superstition with regard to the disease. These points will be discussed under the following headings: I Main Factors, II Secondary Factors, III Subsidiary Factors.

I **Main Factors**

- (*a*) Age
- (*b*) Type
- (*c*) Contact
- (*d*) Race

II **Secondary Factors**

- (*a*) Diet
- (*b*) Sex
- (*c*) Migration of people

III **Subsidiary Factors**

(a) Predisposing di ease
(b) Family susceptibility
(c) Climate
(d) Air food and water
(e) Insect vectors
(f) State of civilisation

## I MAIN FACTORS

### (a) Age of the Individual exposed

The importance of child leprosy has been emphasised by many writers in particular by Vandyke Carter McCoy Rogers Rodriguez Lampe and more recently Doulletals It is our firm conviction that the great majority of those acquiring leprosy are infected and show manifestations of the disease before the age of 15 Rogers and Muir (1946) quoting evidence from South Russia Indian Commission (1890) Vandyke Carter McCoy and Tonkin suggest that the age in which leprosy declares itself is most likely to be in the decades 20-35 From a study of 2 000 cases in the Lady Willingdon Leprosy Sanatorium Chingleput Madras Presidency over a period of seven years the following graph and table give the age when the lesions were first noticed by the patient

TABLE I

| 0–4 | 5–9 | 10–14 | 15–19 | 20–24 | 25–34 | 35–49 |
|---|---|---|---|---|---|---|
| 6 3 | 13 4° | 15 9 | 19 8 | 21 5° | 16 1 | 7 0° |

At the Silver Jubilee Clinic Saidapet Madras the records of over 600 children were studied and Table II gives the age at which the diagnosis of leprosy was made in the various groups

TABLE II

| Age Group | Number of Children with Lepro y | Percentage |
|---|---|---|
| 0–4 | 90 | 1_ _ |
| 5–9 | 315 | 42 8 |
| 10–14 | 332 | 45 0 |

In the graph and tables shown if we were to adopt the suggestion of Rogers and deduct 3-5 years for the latent period of leprosy the figures would afford still stronger support of our contention that leprosy is largely a child di ease Therefore from the evidence sub mitted we believe that the majority of persons acquire leprosy in India before the age of 20 and that many have been infected by the time they reach 15 years of age This opinion has been confirmed by Lowe in an analysis of the survey figures of the Bankura District Bengal

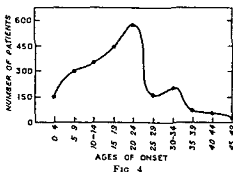


FIG 4

when he says that the years between 3–30 are the most likely years for the signs of the disease to appear and that the maximum appears to be between 5 and 15. The importance therefore of the child in the epidemiology of leprosy cannot be too greatly stressed for we are of opinion that if children are not exposed to infection leprosy would gradually die out of a community. This we maintain was the main cause of the disappearance of leprosy in the British Isles. A time was reached when owing to segregation it was no longer possible for children to be infected and so the disease could not spread because we believe leprosy cannot be maintained in a community in the absence of child infection.

*(b)* **Type of Leprosy**

In the section on diagnosis details are given as to the various types of the disease here *all that is necessary to say is that leprosy from the epidemiological and administrative point of view can be divided into* **open** and **closed** leprosy. *By* **open** *leprosy is meant that form of leprosy which is infective and* **from which the causal organism of leprosy can be discovered from the skin or the mucous membranes by standard methods of examination.** All the evidence which has accumulated over the past seven years confirms our conviction that leprosy cannot be acquired by any other means than by contact with an open case. Considerable controversy has been raised from time to time concerning the infectivity or otherwise of closed cases of leprosy. It is of little value discussing hypothetical instances in which the evidence as to diagnosis, history and previous contact is not available or incomplete. Our experience is that as confidence is established between a community and the investigation officer the number of cases from which infection cannot be traced to an open case of leprosy becomes progressively fewer. Where it is impossible to discover the open case contact and it is chiefly among the more benign forms of leprosy in all probability the history of contact has been forgotten or possibly deliberately withheld. Table III indicates the percentage of untraced contacts in the various types of child leprosy recorded at the Silver Jubilee Children's Clinic, Saidapet.

TABLE III

| Type [1] | Total | Untraced contact | Percentage |
|---|---|---|---|
| N1—Nt Major | 60 | 36 | 60 0 |
| N1—Nt Minor | 225 | 117 | 51 9 |
| N1—Ns | 206 | 97 | 47 1 |
| Incipient Lesions | 38 | 6 | 18 0 |
| Lepromatous | 93 | 24 | 25 8 |

It will be seen that in the most serious forms of leprosy, namely the incipient lesions of childhood and lepromatous leprosy, *over 70 per cent of the* cases have been traced to an open contact. The belief in the infectivity of a closed case of leprosy is dependent on the *somewhat shadowy* theory that the causative organism of leprosy

[1] The classification given here and which will be described later follows in its main details the International classification of the Cairo Conference (1938).

is either not the M. leprae or else the M. leprae in its life cycle passes through a yet unrecognisable form, e.g. a filter passer stage or a non acid fast form, but all such theories, though attractive to some workers, have not been supported by corresponding facts, and the conclusion that we come to is that all the evidence of the past ten years indicates the soundness of the assumption that leprosy is caused by an acid fast organism known as the M. leprae and that the disease can only be transmitted by an open case of leprosy. On such a theory practical preventive measures can be developed, and as our experience increases evidence accumulates in support of this assumption that it is only the open case or the potentially open case that need be considered in the epidemiology of leprosy.

**(c) Type of Contact**

If, as it is maintained, it is only the open case which can transmit leprosy, how is the disease passed on to healthy people? It is our firm conviction that no case of leprosy can arise without previous contact with an open case, and therefore the question of contact in the epidemiology of leprosy is of extreme importance. It is now generally accepted that leprosy is not a hereditary disease, although the question of a family susceptibility will be discussed presently. Records from institutions in India which maintain homes for healthy children of parents with leprosy prove conclusively, if evidence were needed, that provided a child is separated at an early age from all contact with the disease, it does not acquire leprosy. If contact is essential in the acquirement of leprosy, then it is of considerable importance to determine the relative importance of the various forms of contact, and for the purpose of our inquiry this can be divided into intra familial or household contact and extra familial or neighbourhood contact.

TABLE IV

| Type | Total | Intrafamilial contact | | Extrafamilial contact | Percentage |
|---|---|---|---|---|---|
| | | Room percentage | House percentage | | |
| Neural | 20 | 87 42.5% | 30 14.6% (57.1%) | 88 | 42.9 |
| Incipient | 31 | 24 77.4% | 4 12.9% (90.3%) | 3 | 9.7 |
| Lepromatous | 67 | 43 64.3% | 2 2.9 (67.2%) | 22 | 32.8 |

Table IV shows the percentage of cases of leprosy which have been traced to contact within or without the household and demonstrates the fact that not only intra familial contact but room contact is of most importance. This is to be expected because it is analogous to that other infective mycobacterial disease, tuberculosis. If then children were prevented from coming into close contact within the house with open cases of leprosy this one precaution would do more towards the control of leprosy than any other single measure.

that very plausible but interesting book *Leprosy and Fish eating*. In these days of increased vitamin consciousness many of the ills to which human flesh is heir are attributed and frequently rightly so to deficiency in diet. This is always a satisfying hypothesis on which to explain any failure in treatment. Yet however satisfying or popular a hypothesis is it is incumbent on scientific workers to divest themselves of preconceived ideas and to study any theory from an unbiassed view point. Diet experiments were conducted mainly among children in the Lady Willingdon Leprosy Sanatorium and Silver Jubilee Children's Clinic for over four years and no relationship could be discovered between diet and the progress of the disease or the acquirement of the more serious forms of leprosy. In the course of these dietetic experiments the following additional dietary factors were added in sufficient quantities to constitute a marked improvement in the general health of the patients—vitamins A and D in the form of Adexolin, skim milk (vitamin B complex, protein, calcium), wheat diet (vitamin B complex, protein, etc.). In spite of the carefully controlled experiments which were under the advisory supervision of Dr Akroyd (Director Nutritional Enquiry, Indian Research Fund Association, Coonoor) it was found that there was no significant improvement in the children who were given additional dietary factors over those who had no such additions to their diet. In this connection it is interesting to note that the results of treatment in institutions where the diets are the best possible that money can obtain are no better than in those which have a relatively poor diet. While a poor diet is not advocated for in all chronic diseases it is advisable to administer as well balanced a diet as finances will allow, yet it is emphasised that too much reliance should not be placed on the supposed inevitable improvement in the general condition of the patient when diets of an institution have been improved.

Why then has a dietetic factor been stressed as important in the epidemiology of the disease and what is the explanation of the observation that in areas where the diet is good frequently there is comparatively little leprosy? A possible explanation is that in those areas where the diet is adequate it is much more difficult to introduce leprosy, but once leprosy has been established in a community then improvement in diet does not show a corresponding improvement in the incidence of the disease or result in a marked difference in treatment. In other words a poor diet can be likened to the careless match which starts a forest fire, but once the epidemic of leprosy is established the question of diet plays little or no part in its maintenance. The non improvement with treatment is often attributed with too much facility to causes such as poor diet, general health, etc., when the real cause needs much more careful investigation and has so far escaped us.

In this connection the latest diet theory might be mentioned. Oberdoeffer, a German worker, claimed that the eating of *colocassia antiquorum* was an epidemiological factor of importance in the development of serious leprosy. There is absolutely no evidence to warrant such a claim and inquiries along this line have not shown any relationship between colocassia and the incidence of severity of leprosy in South India. Lowe has stated that this theory has no sound foundation and that the consumption of colocassia as such plays no part in the causation or aggravation of leprosy.

**(b) Sex**

Lowe (1934) in an exhaustive review of the literature on sex incidence in leprosy stated that in most countries where leprosy is highly endemic the number of male

sufferers exceeds females by 2 1. No figures as far as is known have been given showing the sex incidence among children and adults but the following table gives the sex incidence in a population of over 5 000 examined in the Saidapet (Madras) area

TABLE VII

| Adults | Sex incidence | Children | Sex incidence |
|---|---|---|---|
| Males | [illegible]1 per 1 000 | Males | [illegible]7 4[illegible] per 1 000 |
| Females | 32 4[illegible] per 1 000 | Females | 68 34 per 1 000 |

It will be noted that in childhood the disparity between the sexes does not appear to be of great significance and therefore it may be that the abortive lesion in female children is more frequent and thus a greater number of male children would develop serious leprosy. We have shown elsewhere that the more serious lesions increase as the massiveness of the contact increases and perhaps the male child not being so confined or reserved as the female child comes into relatively greater contact with an open case in a village or street and hence the male child may develop lesions of leprosy which more frequently tend to progress and persist into adult life. We find the following statement in an article by Hopkins and Faget (1944): That no satisfactory explanation is offered for the almost universal preponderance of males over females nor for the exception found in regard to the Negro race of whom there were admitted into the United States Marine Hospital Louisiana [illegible] men and [illegible]7 women. As a result of surveys in the North Arcot district and elsewhere in Madras interesting observations have been made by Sarma in which it appears that the sex incidence may be of some importance in estimating the state of the epidemic of leprosy in a community than any other single factor for there is some evidence that in areas where the female and male sex incidence is almost equal the epidemic of leprosy may be on the increase whereas in areas or communities where the disease does not appear to be spreading or where it has been established for many decades the male preponderance tends to be more marked in other words there appears to be a relationship between the duration age and intensity of the epidemic of leprosy and the sex incidence. This interesting observation which is the result of recent work done by Sarma in the Madras Presidency needs to be studied in greater detail before definite conclusions can be drawn.

**(c) Migration of People**

Among certain primitive communities and in villages where leprosy has not previously been in existence the disease has been introduced by persons suffering from leprosy entering the village or community. Muir and Santra have cited such instances in the spread of leprosy in certain village communities in India and the epidemic of leprosy in the Nauru Islands was traced to the migration of Chinese some sixty or seventy years ago. This factor is of some importance not because of any increased susceptibility to infection in a so called virgin soil but in such instances the disease is frequently introduced as a result of inter marriage and hence the closest possible contact is established between the infected and non infected sources. In this way

leprosy may be introduced from many miles distant whereas contiguous villages with which there are no marriage relationships have little or no leprosy

## III SUBSIDIARY FACTORS

It is doubtful whether any of these play an appreciable role in the epidemiology of leprosy but as they are frequently *considered of importance* reasons for this statement must be given

### (*a*) Predisposing Conditions and Lowered Resistance

Muir and earlier writers laid great stress on the question of lowered resistance in leprosy The term lowered resistance has been used in a general way meaning a poor or lowered state of health There is however little or no evidence to show that those with poor physique or concomitant diseases e g hookworm dietetic deficiences etc have any greater tendency for leprosy to develop in the more serious forms than persons in whom no such conditions can be found Time and again we see children and adults in a poor state of health anaemic and with marked avitaminosis and yet with benign leprosy and at *other times we see persons apparently strong and healthy* physical examination revealing no marked ill health and yet they manifest a serious form of the disease It is admitted that such a statement is difficult to accept but *in the chapter on Pathology we hope to give further reasons why it is considered that* these factors are of little importance In fact it is very striking how comparatively frequently it is the well nourished and physically fit person e g policemen who acquire serious lepromatous leprosy whereas the undernourished may show benign neural lesions All that can be stated here is that in the opinion of the writer these so called predisposing diseases and lowered state of health have been overrated as epidemiological factors We do not advocate starvation as desirable for we consider a well nourished person means a contented person and possibly in a disease where so little is known of the exact processes of acquirement and spread spiritual and psychological factors of course scientifically not computable are the greatest assets in a return to a more satisfactory state of health Neither can the importance of individual susceptibility be assessed It is known that in all diseases there is great variation in individual susceptibility in persons who are equally exposed to infection and in a chronic and little understood disease such as leprosy this factor cannot be altogether ignored

### (*b*) Family Susceptibility

*Within the last* decade it has been suggested by Aycock that while leprosy is not a hereditary disease a family susceptibility to the *infection may be a major factor in* the epidemiology of the disease A study of such a question is of great importance in India where one so often hears statements of the following nature from distressed patients Doctor there is no leprosy in our family This subject has been studied in some detail at the Silver Jubilee Children s Clinic and I only propose to present a brief summary of the findings In an analysis of a number of families in which the exact relationship of the contact was ascertained it was found that the greatest number of children infected were from co tenants who had no family relationship to the child Again the percentage of children infected by the various relatives and by the co tenants did not show such a marked difference as to suggest that the presence of family

susceptibility was a factor of outstanding importance. Table VIII gives the analysis of 125 families from which these conclusions have been drawn.

TABLE VIII

| | Percentage infected |
|---|---|
| 18 fathers have infected 27 out of 47 children | 57.44 |
| 8 mothers have infected 12 out of 20 children | 60.0 |
| 9 maternal uncles and aunts have infected 13 out of 28 children | 46.4 |
| 16 paternal uncles and aunts have infected 21 out of 34 children | 61.8 |
| 18 brothers and sisters have infected 29 out of 50 children | 58.0 |
| 30 co-tenants have infected 41 out of 80 children | 51.2 |

From a detailed study of the material available the general conclusion at which we have arrived is that while it cannot be categorically denied that family susceptibility has no influence in the development of leprosy, especially of the more serious types, the evidence so far available indicates that this is not a major factor in the epidemiology of the disease. These findings confirm the earlier work of Rodriguez (1926).

(*c*) **Climate**

This has been stressed by Rogers and others, and Mills (1936) suggests it is not so much the relative temperature as climatic variation which may be responsible for the spread of leprosy; in other words, in countries where climatic stimulation is great leprosy appears to be less common. There is, however, little conclusive evidence that climate plays an important part in the epidemiology of leprosy.

(*d*) **Air, Food and Water**

There is no evidence that leprosy can be transmitted through any of these means. While it is not advisable to permit open cases of leprosy to be food vendors, cooks or personal servants, yet the importance of the possibility of leprosy being transmitted by food or water is extremely remote and has been over-emphasised. For instance, in India petitions not infrequently are presented to Government complaining of the fact that patients in a leprosy sanatorium may bathe in a river in which clothes are washed farther down the stream, or in a tank (irrigation lake) the water of which is used for domestic purposes. There are so many other much more likely sources of contact that such hypothetical reasons for infection need not be entertained as practicable or probable methods of spread. Those who handle food frequently come into intimate contact with people, and it is this fact, not the very remote chance of food conveying the disease, that constitutes the reason for prohibiting open cases having anything to do with the supply of food or water to houses.

(*e*) **Insect Vectors**

Many authorities have endeavoured to incriminate insects, e.g. the bed bug, house fly, mosquito, etc., in the spread of leprosy. There is very little proof, however, that any of these insects are the means of the spread of the disease. It must be admitted that it is not impossible for leprosy to be spread by these means, but in all probability they play such a small part in the transmission of leprosy that, for all practical purposes

they must at best be a very minor factor in the spread of the disease. The insect which to some extent is incriminated is the sarcoptes scabiei, for not only does this require intimate contact for infection but the parasite buries itself deep in the skin and hence if a scabetic infection is acquired from a person suffering from "open" leprosy there may be a greater possibility of contracting the disease, although Rodriguez (1926) in his monograph on early leprosy in children does not admit of this.[1]

**(f) State of Civilisation**

It has been observed that in countries with an advanced state of civilisation and a well developed public health conscience leprosy does not readily spread, while among aboriginal tribes, e.g. Ainus of Japan and Negritos of the Philippine Islands, who have had no intimate contact with the outside world, leprosy appears to be non-existent. The conditions of living among a people who have left their primitive seclusion for the greater promiscuousness of a developing civilisation may be more favourable to the spread of such diseases as leprosy. In passing it is necessary to distinguish "culture" from "civilisation". A nation may have a high and ancient culture but according to modern standards not highly civilised; on the other hand a nation may be highly civilised but poor in culture. Again, undue importance cannot be attached to this factor, for as members of a community advance they become more interdependent and any influence that a developing civilisation has on the acquirement of leprosy can probably be attributed to the greater amount of contact which results under such conditions.

## CONCLUSION

All the work in the Madras Presidency during the past ten years tends to confirm the opinion stated in this chapter that the only factors of practical importance in the epidemiology of leprosy are the age of the individual at the time of infection, the closeness of contact and the massiveness of the infection. The only other influence which appears of direct importance in the epidemiology of leprosy is the race of the person exposed to infection. In other words leprosy is a contact disease and any factor which encourages overcrowding and close bodily contact is of great importance. We believe that the explanation of the acquirement of leprosy is relatively simple, but because the organism has never been definitely cultivated and because there are many as yet unsolved problems, this simple explanation as to how persons acquire leprosy does not always seem to be acceptable. We are of opinion that undue stress laid on factors which can at the most be only of minor importance is undesirable, because attention is detracted from the overwhelmingly important epidemiological causes—that of age, type of disease, type of contact and race—and this results in effective preventive measures being delayed or not put into operation, and retards the successful development of the leprosy campaign. The fact that a number of cases of leprosy may arise in European and other troops who have served in the East during the second world war does not vitiate these conclusions, for these represent the few instances of persons with a high individual susceptibility, and this, as previously mentioned, cannot be computed and may give rise to leprosy on minimal exposure.

[1] Recently Morser (194 ) has put forward a theory which incriminates the cockroach as a vector in leprosy but this work has received as yet no confirmation.

CHAPTER IV

# PATHOLOGY

The greatest advance in leprosy during the last decade is seen in our clearer understanding of its pathological processes especially in the histopathological changes in the various forms of the disease. While Henderson enlarged on the earlier work of Muir, it was not until Wade took up the study of the tuberculoid macule and drew attention to the fact that the early continental writers—e.g. Jadassohn, Lie, etc.—recognised such lesions and emphasised their importance that there was any great incentive to investigate the detailed histopathological changes in the skin. About the same time the importance of the lepromin test was increasingly realised as a result of the work of Mitsuda and Fargehr followed up by Hayashi and others. All these advances have a bearing on the pathology of leprosy and we shall consider in this chapter the tissue changes in the body, particularly the skin, in response to invasion by M. leprae.

In the chapter on epidemiology we have subscribed to the view now generally held that the organism of leprosy is introduced into the body through close and generally prolonged contact with an open case of leprosy. In all probability it is through abrasions of the skin and mucous membrane of the nose that such entrance is found. Owing to the long latent period of the disease and to the inability to produce progressive lesions of leprosy in animals, it is impossible to confirm the opinion that the M. leprae can find entrance to the body through the unbroken skin. In any case such a discussion is only of academic importance, for all children, and particularly those in tropical and sub-tropical regions, have innumerable abrasions as the result of insect bite, septic infection or scratch abrasions due to heat and other forms of irritation which constitute possible portals of entry for the organism of leprosy. In the latter part of this century Hansen, Impey and others emphasised the self healing nature of leprosy. Muir confirmed this in his observations over a period of years, but it has only been emphasised more recently that of the many persons who are infected with leprosy comparatively few develop serious forms of the disease. This observation is of great importance for it robs leprosy of a great deal of its terror and is of particular significance in the prevention and prognosis of leprosy. As far back as 1926 Rodriguez indicated that early suspicious macules are changeable and evanescent and may be found a few months later to have become negative even without treatment. Little importance was attached to the significance of such a statement, but in 1931 it was suggested by Cochrane that much leprosy was innocuous and because a given person showed signs of the disease it did not necessarily mean that the individual inevitably progressed and finally, unless treated, became an advanced case. This tendency for the body to overcome infection by M. leprae is well shown in Table IX which illustrates the progress of cases over the years 1937–44 at the Silver Jubilee Clinic, Saidapet, Madras, among a group of children definitely diagnosed as suffering from leprosy yet receiving no treatment. When the assessment was completed in December 1944, 67 children originally registered in 1937 remained in Saidapet and had been kept under observation

for seven years and a total of 249 children had been under observation over the period in question

TABLE IX

| (i) Year | (ii) Total | (iii) Much improved | | (iv) Improved | | (v) Stationary | | (vi) Worse | |
|---|---|---|---|---|---|---|---|---|---|
| | | No | Percentage | No | Percentage | No | Percentage | No | Percentage |
| 1937 | 67 | 44 | [illegible] | [illegible] | 8 9 | 3 | 4 5 | 14 | [illegible] |
| 1938 | 39 | | 64 | 7 | 17 9 | | 5 1 | 5 | 1 8 |
| 1939 | 31 | 19 | 61 3 | 5 | 16 1 | 3 | 9 7 | 4 | 1 9 |
| 1940 | 31 | 17 | [illegible] | 4 | [illegible] | 8 | 8 | — | 6 5 |
| 1941 | [illegible] | 13 | [illegible] | 4 | 11 4 | 9 | [illegible] | 9 | 7 |
| 194 | [illegible] | 3 | 17 8 | [illegible] | [illegible] | 6 | [illegible] | — | [illegible] |
| 1943 | [illegible] | 3 | [illegible] | 10 | 40 0 | 8 | 3 0 | 4 | 16 0 |
| 1944 | 5 | — | — | 1 | 0 0 | 4 | 80 0 | — | — |
| 1937–44 | 49 | 1 4 | 43 8 | 4 | 16 86 | 43 | 17 7 | 40 | 16 0 |

Column (iii) may be further analysed as follows In 50 8 per cent of the 1 4 much improved cases all lesions disappeared while in 49 per cent they remained as residual lesions i e inactive but still visible It thus appears that amongst these children leprosy is not generally a progressive disease for in only 16 per cent has deterioration of their condition occurred, and in 50 per cent the disease has undergone spontaneous disappearance resolution or arrest

The above table gives striking evidence of the tendency to the spontaneous disappearance of neural lesions in childhood Thus support is given to the contention that *in the majority of the children in South India leprosy is a benign non progressive disease and that of all children who acquire the disease probably less than 50 per cent progress to the more serious forms* This subject will be dealt with in more detail in the chapter on the development of lesions It will be asked at once what are the reasons for leprosy progressing? In the previous chapter we indicated that the four important factors in the epidemiology of the disease are age type of disease type of contact and race We are of opinion also that these are the main influences which cause leprosy to become progressive in other words *the younger the person infected the more massive the infection the greater the chances are that leprosy will not only extend* but will develop into the serious lepromatous form

It is believed that a close study of the pathology of the disease especially the cellular reactions stimulated by the invasion of the M leprae is a most fruitful line of investigation and should more surely bring us to a solution of the problem than any other avenue of research The pathology of leprosy will now be discussed under the assumption that in the average person the M leprae finds it very difficult to establish itself in the tissues of the body and that all tissue reactions in the presence of M leprae *are defensive in character* and that the defence is more frequently successful but in a certain proportion it is unsuccessful whereas in others we see partially successful defence In the early cases which become abortive we do not know the exact defensive mechanism but it is suggested that because M leprae is a very lowly pathogen that under ordinary circumstances the human organism can deal with relatively small introductions of the bacilli and therefore leprosy in its clinical form never appears Again where lesions have appeared it is possible that the M leprae in certain instances do not multiply sufficiently to result in the stimulation of the defensive processes in

the body and that the bacilli are either rendered harmless by being confined to some lymph gland or tissue space or are dealt with by the wandering cells of the reticulo-endothelial system It is difficult to state from the histological changes in the early macules of leprosy whether a given macule is likely to develop and progress for it is not until characteristic histological changes take place that one can estimate the probability or not of a given lesion developing into the more serious form of the disease We cannot therefore trace the development of leprosy from the introduction of the bacilli to its more advanced stages all that can be done is to indicate the possible method of progress and describe in more detail the characteristic histological changes in the various types of leprosy

*It is well established that there is no true incubation period in leprosy but that* years may elapse between the introduction of the disease to its manifestation Rogers and Muir give the average period as 2–5 years while infection in a child of six months has been recorded and in an adult after she left an endemic zone forty years previously The latent period of leprosy is therefore probably a matter of years rather than months

Elsewhere I have suggested that leprosy develops from certain basic lesions and since this publication I have no reason for altering the opinion then formed In children then there are certain definite and characteristic histological changes in the skin and before a general discussion on the pathology of leprosy can be entered upon these changes must be described The occurrence of an initial or primary lesion in the skin in leprosy has been accepted by Rogers and Muir (1925) Rodriguez (1936) and others and these workers have supported the ascending neural hypothesis propounded towards the end of last century While ascending nerve infection cannot be definitely disproved because as will be described later there is evidence that in certain forms the bacilli set up tissue reactions which can be traced along the nerve cords in the skin In a disease however with such a long latent period it is considered that the first clinical evidence of leprosy does not necessarily indicate that this is an initial or primary lesion but may simply be the first external manifestation of infection with the M leprae A hypothesis will be suggested which it is claimed explains the method of development of lesions of leprosy without the necessity of assuming a primary infection at the site of inoculation While the possibility of this is not denied it appears much more reasonable to conclude that as in tuberculosis so in leprosy infection as a rule takes place in early years and that only when conditions are favourable to the multiplication and spread of the bacilli do definite clinical lesions make their appearance These conditions are not altogether understood but some of them have been discussed in the chapter on epidemiology

In the development of this hypothesis it is contended as already stated that the M leprae is a very lowly pathogen and that it establishes itself in the human tissue with very great difficulty Assuming then that infection has taken place as has been indicated one of three things may happen (*a*) the person may never develop leprosy and thus no indication of a previous infection is available (*b*) the person may develop leprosy which shows itself in clinical lesions which may remain stationary or disappear entirely either by themselves or as a result of the development of a tissue immunity (*c*) the lesions may progress and the person become an advanced case of leprosy

The conditions under which clinical lesions develop and progress to the more serious forms of the disease are not entirely known The wandering cells of the body

in all likelihood are probably able to deal by phagocytosis with considerable numbers of bacilli if introduced into the body but if this is impossible because of the numbers of bacilli introduced by the original inoculation or inoculation or for some other as yet unknown reason then the bacilli pass to the skin and clinical lesions make their appearance The threshold if one may use the term above which the body cannot deal with the organism must vary with each individual As stated in the previous chapter in addition to massive inoculation age is an important factor and apparently young persons are less able to cope with the introduction of the M lepra than adults Once clinical lesions manifest themselves the further progress of the disease seems now largely to depend on whether the body can prevent the general dissemination of the bacilli throughout the reticulo endothelial system or not In other words it is assumed that in the development of disseminated lesions of leprosy there is a cycle which must be completed I am coming more and more to believe that unless the bacilli are disseminated via the skin no progressive lesions of leprosy can develop If the bacilli are prevented from multiplying in the skin the disease then becomes abortive and generalised leprosy is not seen If this cycle could be pre vented either by a tissue reaction anchoring the bacilli and preventing its spread to internal organs or by some drug injected into the skin causing the skin tissue to become unfavour able to the multiplication of the bacilli then lepromatous leprosy might not be possible of development It is known that there is a defensive mechanism anchoring the bacilli in the skin and preventing its general dissemination but where this defensive re ponse is absent there is no means as yet known whereby it can be stimulated The questions of diet predisposing causes etc in preventing the dissemination of leprosy are of minor importance It is believed that once clinical signs of the disease are manifest the prevention of more serious lesions rests with the defensive mechanism of each individual and so far nothing is known which will improve a defensive mechanism if it is not already inherent in the individual There is however some evidence that sub minimal infections may increase tissue immunity whereas massive infections may break down this immunity



FIG 7 —Early neural case showing a concen t ation of round cells un lerneath the epidermis (× 200)

It is believed that the M leprae is more closely related to the soil saprophytes than to the disease producing bacilli and that in its method of attack it behaves more like a parasite invading the tissue than a toxin producing organism and therefore in order to establish itself in the body certain barriers have to be broken down It is a well known fact that pathogenic organisms have a predilection for certain tissues e g B typhosus for the intestine the meningococcus for the meninges M tuberculosis for lungs bones joints and intestines etc The M leprae, we believe shows its pre dilection for cutaneous tissues and if we look upon a nerve tissue as embryologically

an infolding of the primitive ectoblastic layer it can be understood why this should also be attacked It has already been stated above that we believe that leprosy can only become a progressive disease as a result of spread from a primary focus Where the primary focus is it is difficult to say it may be in the nerve skin lymph node or somewhere in the reticulo endothelial system but no clinical signs of the disease can appear except as a result of the spread of the bacilli from the primary focus and it is only when clinical signs show themselves that we can estimate whether the tissue defence which the body builds up will succeed in preventing the dissemination of leprosy In this connection it should be noted that bacilli have been found in lymph glands of apparently normal individuals living in close contact with persons suffering from leprosy but how far the early work of Sorel and Leboeuf (1912) has been confirmed the author is unaware It may be considered unscientific to describe the attacks of the mycobacterium leprae in military terms As an introduction to the matter which is to follow and in an attempt to make the description clearer the defences of the body against the M leprae can be likened to modern warfare where on the one hand the Russian defence was successful and the armoured thrusts of the enemy were nipped off and rendered innocuous or on the other hand where the British defence was unsuccessful as when opposed by the infiltration tactics practised by the Japanese Bearing this analogy in mind we shall describe the defence of the tissue against the M leprae in terms of successful and unsuccessful defence We are of opinion that clinical signs of leprosy appear as a result of the activation of a primary focus the M leprae multiplying showing their predilection for cutaneous and neural tissues The first lesion frequently noted is a macule and the early macules of leprosy can be divided histologically into those lesions in which round cells are concentrated around the hair follicles and vessels in the corium and in which

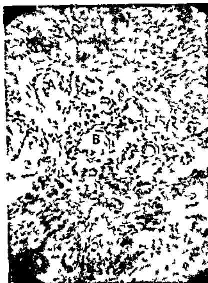



Fig 8 —A section from a simple macular (neural) case showing commencing nerve invasion in the corium (× 400)
A Small nerve extensively invaded
B Small n showing light round cell increase (× 00)

there is commencing invasion of nerves in the subcutaneous tissue and those lesions in which round cells and to a greater degree macrophages are scattered diffusely underneath the epidermis with no invasion of the subcutaneous nerves It is important to recognise this difference in the histology of the early macule because the former shows potential tissue resistance and in the latter there is no such evidence We will now discuss briefly what we believe takes place in the further development of these lesions It is to be noted that early lesions of leprosy show histologically non specific changes the cells that are mobilised are ordinary round cells but the perivascular and perifollicular concentration of round cells indicates an early attempt on the part of the tissues to limit the infection In individuals in whom a more marked defence is stimulated either because the bacilli are more active or because the tissues react

more strongly to the presence of a few bacilli the typical changes shown in active and effective defence are seen At this stage it is noted that the second line of defence is mobilised and macrophages (wander cells) are conspicuous These macrophage are arranged in typical foci or tubercles and assume the characteristic appearance of epithelioid cells These cells have been described as cells with large palely staining oval nuclei poorly supplied with chromatin and with a broad irregular protoplasmic body which presents a homogenous appearance The outlines of the cell body can only be made out with great difficulty in most instances The origin of the cells is still in doubt According to Baumgarten they arise from a proliferation of the fixed connective tissue cells which is the result of irritation due to the presence and growth of the specific bacilli In a publication on cytology and cell physiology edited by G Bourne the opinion is given that epithelioid cells are transformed macrophages characterised by a central mass of fine granules stainable vitally with neutral red The oval nucleus lies excentrically The following comment is made that monocytes macrophages and epithelioid cells represent functional variations of the same cell type




Fig 9 —Section from an early tuberculoid lesion showing a tuberculoid focus in the corium (× 200)
A Epithelioid cells
B Blood vessel
C Subcutaneous fat

These foci because of the resemblance to changes seen in tuberculosis are called tuberculoid foci and consist of a peripheral concentration of round cells with well marked epithelioid cells in the centre The foci are seen mainly around hair follicles sweat glands and the vessels of the corium In marked cases the epithelioid cells coalesce and form giant cells the majority of which are of the Langhans type The result of this process is that the bacilli are anchored in the tissue and the spread of the infection prevented When the infective process has been dealt with the cellular reaction disappears and the lesions retrogress clinically and become healed This accounts for the spontaneous disappearance of lesions in tuberculoid leprosy and it may be noted that the more active the tissue reaction the more rapid is the resolution of the lesions In other words to use the military analogy the spearhead of attack of the bacilli is cut off at the skin rendered innocuous and the attack aborted This tissue anchoring process is well illustrated by the fact that the granuloma extends up to the epidermis without any separation or free space between the epidermis and tuberculoid foci in the corium It will be noted that we refer to the characteristic cell of the tuberculoid foci as epithelioid following the practice of Wade rather than the term endothelioid as used by Macleod Muende and others Further the phrase tissue immunity is used rather than such words as allergy or tissue sensitisation Both these terms are possible of several interpretations and the general picture of a tissue anchoring process resulting in an effective defence on the part of the body seems to be a clearer conception of the pathology of this type of leprosy If this paticular reaction of the

tissues is a form of tissue immunity then all the lesions of the body should show a similar reaction in the presence of M leprae We believe that where this resistance is present whatever tissue the M leprae attempt to invade tuberculoid foci are set up anchoring the invading organism and therefore the nerves in the corium show the same reaction Hence it is difficult to say whether the infection in the nerves is an ascending infection from the skin or whether the same reaction is produced in the nerves by the simultaneous dissemination of the bacilli to the skin and the nerves from an internal focus If this reaction is seen wherever bacilli are found why have not the histological changes of a tuberculoid nature been described in the internal organs? The reason for this we believe is that M leprae can only invade pathologically the whole reticulo-endothelial system by first passing from an internal focus to the skin and then becoming disseminated throughout the whole body through lymph and blood channels In tuberculoid leprosy the bacilli are walled off in the subcutaneous tissues and there is no possibility of their widespread dissemination It is true that the bacilli may pass to the lymph nodes and other glands for Lowe has described tuberculoid changes in lymph nodes and we have recorded a definite case of tuberculoid reaction in the lachrymal gland

A definition of tissue immunity might clarify our minds at this point By tissue immunity we mean the ability of the skin to anchor the bacilli and prevent their dissemination throughout the body

It will naturally be asked whether the bacilli can be found in this type of lesion Usually the lesions are negative to ordinary methods of examination but in the lesions showing gross tissue immunity bacilli are frequently found sometimes in large numbers but they are not usually demonstrable in the skin for more than three months the violence of the tissue reaction we assume in some way affects their nutrition and they disappear from the tissue It is because of the paucity of the bacilli in neural leprosy that theories as to the possibility of different forms—non acid fast—filter passing etc —or different strains of the organism have been conjectured Of this there is not one iota of proof and to our mind the more reasonable explanation is that the tissues set up such an active defence that the bacilli are unable except in the more active cases to multiply sufficiently for them to be detected by ordinary means in the tissues This form of tissue reaction may be styled effective and active cellular defence As has been pointed out the M leprae not only has a predilection for cutaneous tissue but also for neural tissue and as will be described there is a type of the disease—neural anaesthetic—in which the main if not the full brunt of the attack falls on one or more of the larger peripheral nerves—ulnar or peroneal In this type another reaction is seen which from

Fig 10 Section from a tuberculoid lesion showing moderate tissue reaction Note granuloma extends up to epidermis (× 100)
A Epidermis
B Epithelioid cell
C Giant cell

the point of view of the prevention of dissemination of the organism is just as effective a defence but results frequently in gross mutilation The reaction is one of fibrosis and we assume that in consequence of the activation of a primary focus the bacilli pass to one or more of the larger nerves and in consequence a violent tissue reaction sets in which is not seen in the form of tuberculoid change but in an interstitial fibrosis of the nerve *resulting in destruction of the bacilli* with inevitable strangulation of the nerve by such a process As stated this fibrous tissue reaction is seen particularly in the neural anaesthetic case and to some extent in neural lesions which show macules in the skin (simple macular lesions)



FIG 11 —Section from a major tuberculoid lesion showing gross tissue immunity

Note —No free sub epidermal zone and large giant cells immediately beneath the epidermis (× 200)

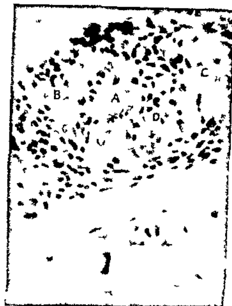



FIG 12 —Section illustrating nerve invasion

A Small giant cell } upper nerve bundle
B Epithelioid cell } upper nerve bundle
C Lower nerve bundle uninvaded
D Middle nerve bundle partially invaded
(× 400)

In tuberculoid leprosy the nerves are also involved but in this instance it is not a fibrous tissue reaction which is first seen but a more active cellular type of reaction which not infrequently results in caseation and nerve abscess formation The recognition of these two varieties is particularly important because in the fibrotic type operation is useless but in the active cellular type operation is the treatment of choice As will be pointed out in a later chapter the decision to operate depends entirely on the nature of the tissue reaction

We now turn to the question of the method by which the body deals with M leprae in those cases where an effective defence is not possible of development Again we believe that the earliest lesion is a macule but in this case instead of the round cells being concentrated around hair follicles and sweat glands they are diffusely distributed

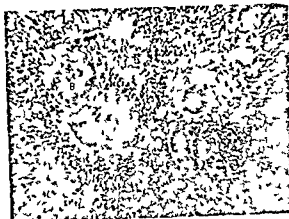



Fig 13—A ect r l t l l l l l
pulp br l p tr t t l l r l gl l
A G nt ll P A f l t l t 00)

under the epidermis and in addition in an early stage wander cells or macrophages are more conspicuous The other difference in the histological appearance is that in this instance the nerves in the corium show little or no invasion whereas in the macule which shows commencing effective tissue defence the nerves in the corium show infiltration with round cells If as we believe the more serious form of leprosy develops from these lesions which show such vague and non specific histology what is the process of development? We believe that the process is essentially the same As a result of the multiplication of M leprae they pass from the primary focus to the skin but in this instance the tissues are unable to anchor the bacilli and macrophages are mobilised in order to deal with the infection but instead of these cells developing into epithelioid cells and giant cell resulting in a tissue anchoring process and so preventing the dissemination of the bacilli, they become actively phagocytic and commence to ingest the bacilli The activity of these lesions is noticed histologically by the fact that instead of the infiltration extending up to the epidermis there is a characteristic clear zone between the epidermis and the granulomatous infiltration These actively phagocytic macrophages are named lepra cells hence this type of leprosy in which these cells are the predominant feature is called lepromatous leprosy In the lesions of lepromatous leprosy there is no evidence of any ability on the part of the skin tissue to cope with the bacilli the multiplication of which in the skin results in an extensive dissemination of the organism throughout the systemic system This is first seen in the extension of the disease and fresh lesions appear in the skin all of which show the same essential histology This process entails the spread of the bacilli from the skin to the lymphatics and to the blood stream and thus the whole of the reticulo-endothelial system become so extensively invaded that bacilli can frequently be found in the spleen liver and even in the bone marrow Once the organism has broken down the initial barrier



F 14—Sect on from m nor tuberculo d ll trat ng e ly n rv in a on Note the m l ll nd p tl el o d c ll mutually w th n the nerv t se (×400)

This conception of the pathology of the disease is based on the assumption that the M leprae is a parasite of the reticulo endothelial system and that wherever possible the body puts up a tissue defence preventing it from infiltrating throughout that system but where this is impossible the only alternative is for the macrophages to deal with the ever multiplying bacilli by phagocytosis which results in a vicious cycle from primary lesion to skin from skin to lymph nodes spleen liver bone marrow This type of ineffective defence has been previously likened to the Japanese tactics early in 1942 and therefore to use the graphic terms of modern times as a result of the infiltrating process the reticulo endothelial system becomes occupied territory and as yet no way has been discovered to dispossess the body of this enemy invader [1]

The only organs that are grossly affected in advanced leprosy are the naso pharynx trachea the testicle and the eyes In all these cases the pathology is not a specific one and can be explained entirely along non specific lines Owing to the presence of innumerable bacilli in the mouth nose and throat ulceration and secondary fibrosis is liable to result producing marked deformity and in certain cases marked ulceration and stenosis of the larynx The presence of bacilli in the testicle gives rise to constant irritation which also ends in an interstitial fibrosis gradually destroying the organ Bacilli invade through the blood stream and by direct spread via the naso lachrymal sac the whole choroidal coat of the eye and thus advanced cases are liable to develop an iritis iridocyclitis or even a panophthalmitis



FIG 19 —Section from moderate leproma showing nerve clearly defined in deeper part of corium around which there is quite marked granulomatous tissue almost all cells of which are lepra cells

The reason for bacilli disappearing in the skin can only be explained we believe by the fact that as a result of their constant presence in enormous numbers the nutrition to the skin is in some way affected and they can no longer get the sustenance necessary to maintain their growth and multiplication Some support is given to this statement because it is a well known fact that starvation or any process which causes emaciation e g arsenic poisoning may result in the bacilli disappearing from the skin only to return

[1] The following quotation from the writings of Wiley D Forbus is relevant at this point

Macrophages which survive are not always immediately able to destroy or otherwise dispose of the ingested organism Because of this one of the most phenomenal and significant forms of host parasite relationship genuine intracellular parasitism may arise Through this at least temporary but intimate relation between the macrophage and the organism a basically useful and distinctly protective mechanism sometimes becomes a major liability to the body as a whole This liability arises chiefly from the wandering habits of the macrophages The phagocytic process takes place in the injured area but the digestive activity of the macrophages only begins there These cells make their way rapidly into the blood capillaries and especially into the lymphatics by the latter they are carried to the regional lymph nodes in the sinuses of which they complete their digestive activities or they die No doubt many of them pass on into the general circulation and there disintegrate Thus phagocytosis becomes actually harmful since it has developed into a means of widespread dissemination of harmful agents

when the skin recovers its normal texture A careful and detailed research of the biochemistry of the skin might throw important light on the elements in the skin needed to nourish the bacillus and lead to more successful attempts at growth or to a line of therapeutics which would prevent the bacilli from multiplying in the skin For if this could be done we believe that the vicious circle which results in the dissemination of the bacilli from primary focus to the skin and from the skin to the reticulo endothelial system would be broken and the disease overcome In the light of these remarks it can be well understood that it is possible that a well nourished skin is a better pabulum in which the bacilli can develop and multiply than an undernourished one Therefore we believe we have a pathological basis for our contention that the place of predisposing causes in the epidemiology of leprosy has been exaggerated out of all proportion to its importance



Fig 10 —A good exampl of gyn ecomast a re ulti g f om d t uction of th testicl (mod t ly a l an l l p om to a. )

Before briefly discussing the nature of the tissue immunity in resistant leprosy it might be well to consider the pathology of lepra reaction This condition only occurs in lepromatous leprosy and is manifested by a rapid multiplication of the bacilli and dissemination throughout the reticulo-endothelial system Its nature has been discussed by many writers and is not altogether understood it is not in the nature of tissue immunity because there is no attempt on the part of the cell to anchor the bacilli and it is difficult to explain on the hypothesis of a toxic condition although cachexia after prolonged reaction does set in Rather do we feel that it is due to the stimulation of the reticulo endothelial system causing an intense mobilisation of macrophages in their attempt to dispose of the bacilli in the lymph glands liver and spleen the violence of this defensive mechanism throws the body out of balance and sets up febrile attacks which may continue for months or so long as the state of acute activity exists Sometimes this multiplication of bacilli results in such a mobilisation of cell that lymphocytes are if it may be said brought in to assist the defensive mechanism and actual pus cells are seen and the whole skin is a mass



Fig 1 —M d t ly l a ed l promat s ho h u g nf lt ti n f a ppl s a re lt of ext n i n of the t e e f m urr d ng k

of suppurating lesions In other words lepra reaction is a form of defence but ineffective defence for the body cannot cope with the multiplication of the invading hosts of bacilli and deals with them in the only way possible by transferring as many bacilli as possible to the bone marrow liver spleen and throughout the reticulo endothelial system

While this description of the pathology of leprosy covers the majority of the instances there are groups of cases not wholly understood but which are of great importance in the question of diagnosis and prognosis In this form an attempt at tissue immunity is seen and epithelioid and giant cells sometimes of great size are formed The great activity of these lesions however is seen by the fact that there is no anchoring



FIG 2—Intermediate or border line lesion showing tuberculoid type of tissue reaction with free sub epidermal zone (× 200)




FIG 3—Note free sub epidermal zone at A Enlarged capillaries B Giant cell C (× 00)

of the processes in the skin but a characteristic free and very vascular zone appears underneath the epidermis In this reaction tissue immunity appears to commence but has a tendency to break down for there is a great accumulation of macrophages many of which are identical with the lepra cells already described These lepra cells have a tendency to become vacuolated and the true foamy cell is not infrequently seen Whether the bacilli are found in the systemic system is not known but this incomplete or partial immunity frequently results in the disappearance of lesions sometimes owing to gross nerve change with marked deformity at other times with little or no deformity Whereas in tuberculoid leprosy tissue immunity is seldom if ever broken down in this type owing to the fact that there is only partial tissue immunity there is a greater tendency for the balance between bacilli and the tissue to be upset and then definite dissemination of the bacilli takes place and the patient passes into lepromatous leprosy This partial immunity results in the development of a lesion with histological

characteristics of tuberculoid leprosy as seen by the formation of giant cells and epithelioid cells with gross nerve involvement Side by side with these changes are seen changes characteristic of lepromatous leprosy lepra cells sometimes foamy cells with a free and very vascular sub epidermal zone It is in this type of leprosy that gross ulceration of the skin may take place and frequently to an alarming extent but the ulceration usually clears up in a few months often leaving marked scarring and deformity

In this group of cases the tissue reactions are very varied and it is almost impossible to give an adequate picture of these changes suffice it to say that certain tissue reactions are akin to lepromatous leprosy others to tuberculoid leprosy whereas still



FIG 4 — Atyp l l n sl owing y va ular su l p l m l fo my cells an l gi nt f mv c lls (x 00)

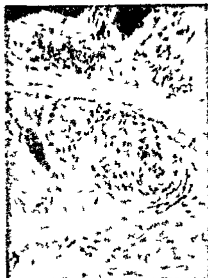


FIG — Atypical l n sh w ng masses of p tl l o l ell ar l th ep l rm (sarco l l type) ( 300)

others very closely resemble the sarcoids In these varieties it is as if the defences of the body are thrown into complete confusion and every variety of wandering cell i mobili ed to deal with the invader This form of defence can only be described as partially effective because there is some evidence as seen in the occasional develop ment of iritis in these cases that the bacilli become dis eminated and it is such ca es that may pa s on into the lepromatous stage Until the pathology of the e intermediate or border line ca es is better understood the significance of the ti sue changes cannot be accurately appraised

In the light of these statements and the relatively extremely serious outlook in lepromatous leprosy how is one to explain the fact that a certain proportion of lepro matous ca es have been known to overcome the di ease as a result of intensive treat ment ? The method of dealing with the organism in the e cases and the rea on for its di appearing from the skin is little understood It is felt that modern treatment

especially intradermal injections sets up a condition in the skin which may result in either a temporary or a permanent state in which the bacilli cannot multiply in the skin and hence the pathway for dissemination through the body is cut and as stated previously unless multiplication takes place *via the cutaneous tissue the M lepræ* appear to find it difficult if not impossible to become firmly established and remain latent in the reticulo endothelial system without showing clinical manifestation of the disease Unsatisfactory though this explanation is there seems no other way to explain



Fig 26 —In adjacent field several *foamy cells (b) were discovered (× 400)*




Fig 27 —High power photomicrograph of *giant cell in deeper part of corium* (× 400)

*the not infrequent recovery from the early lepromatous leprosy for there is no evidence* in such cases of any immunity for should this armistice if one may term it between the cutaneous tissues and the bacilli break down the whole process of skin invasion and general dissemination of the bacillus is seen again and no immunity either tissue or humoral seems to have resulted from any previous temporary disappearance of *outward signs From this description* of the pathology of leprosy it can be understood why so much stress is laid on changes in the corium of the skin For it appears to be the only place where an effective attack on the bacilli can take place so as to stop the spread of the disease and prevent the vicious circle of re infection

## CHAPTER V

# DIAGNOSTIC AND OTHER SEROLOGICAL TESTS

It will be readily understood that the question of immunity in leprosy is an extremely difficult and complicated one. For the past twenty years or more attempts have been made to discover a specific immunity test. If the conception of the pathology of leprosy described in the previous chapter is correct, then it will be realised why a specific serum or complement fixation test is unlikely to be discovered. The more serious lepromatous type of leprosy, we believe, is a parasitisation of the reticulo-endothelial system and this can only be accomplished as the bacilli pass from the primary focus to the skin and then throughout the reticulo-endothelial system. This invasion of the reticulo-endothelial system occurs only in those persons whose tissues are unable to anchor the organism and prevent its spread through the subcutaneous tissue. Hence any resistance the body is able to put up is a very specialised type of tissue resistance and is in no sense a "humoral" one. As there is no specific serological test of any value in the diagnosis of leprosy, it is only necessary briefly to refer to the tests which from time to time have been advocated or tried in leprosy. Over twenty years ago Taylor and Malone (1925) described a complement fixation test using as an antigen a saline suspension of tubercle bacilli. The modern counterpart of this test is that of Witebsky, Klingenstein and Kuhn and Low and Crevel (1939) using this test came to the conclusion that it was little help in the diagnosis of leprosy and was only positive in those cases which were strongly positive bacteriologically, particularly in lepromatous leprosy.

Wade (1926) made a study of the serum of patients by means of certain non-specific tests, chiefly the nitric acid reaction of Bruck. This consists of a determination of excessive globulin precipitate formed by nitric acid in dilute serum. Wade showed that there was some relationship between the advancement of the disease and the positiveness of the test. The test, however, is a non-specific one and changes in the serum globulin and serum albumen ratio are noticed in other diseases, e.g. kala-azar. In connection with the latter disease Napier's formol-gel test has been tried in leprosy and McKenzie (1933) noticed that it tended to be high not only in advanced lepromatous (nodular) leprosy but also in the presence of chronic bone sepsis.

**Sedimentation Index Test**

This test depends on the rate at which erythrocyte sediment when citrated blood is placed in graduated pipette. It is, however, not a specific test but is an index of the debility of a patient. Normally the erythrocyte sedimentation index should be below 10, but any condition which results in the breaking down of effete and dying cells or increases the metabolic rate of an individual will show a rise in the sedimentation test. This test has been largely used in rheumatic fever, tuberculosis, rheumatoid arthritis and many other conditions in order to gauge the progress and the activity of the particular disease. There are very few workers to-day who rely on the sedimentation index test alone. For instance, the tuberculosis specialist uses the sedimentation

index test in conjunction with the X ray bacteriological examination of the sputum and the Arneth count giving due emphasis to each factor before endeavouring to give an opinion Similarly we believe the *sedimentation index test in leprosy* cannot be used alone but must be correlated with the clinical and bacteriological findings The greater the experience of the leprologist the less he will rely on such non specific tests as the sedimentation test While it may be of some help in indicating the activity of the disease it is affected by too many extraneous factors to be of any real value The implication of this statement will be discussed in the chapter on Control and *Treatment*

Any standard method may be used and those interested are advised to consult larger works but the simplest technique is that advocated by Muir and is carried out *as follows*

0 3 c c of 5 per cent solution of sodium citrate in distilled water is drawn into an all glass 2 c c syringe 1–2 c c *of blood is drawn from the patient s* vein into the same syringe and a small quantity of air having been taken into the syringe barrel the blood and citrate solution is thoroughly mixed by reversing the syringe several *times and the mixture is transferred into a clean test tube* Sedimentation is carried out in 300 mm pipettes graduated from above downwards from 0 to 100 The capacity of the pipette when filled up to zero is approximately 1 c c but a variation of 0 05 c c *is allowed as such a variation makes no appreciable difference in the results* Then the pipettes are placed in a rack with their points inserted in small holes bored in rubber corks

*One of these pipettes is taken from the rack and its point is inserted in one of the* test tubes suction being applied by mouth at the other end of the test tube the blood citrate mixture is drawn up into the pipette to the zero mark

*The pipette is then replaced in the rack the point again being inserted in the* rubber cork which prevents the mixture escaping The rack with the pipettes should then be placed in an incubator at 37 C if this is available If this is not available incubation at room temperature is *sufficiently accurate*

The top level of the erythrocytes is read off after 1¼ hours and again after 2½ hours and the average of these two readings is taken as the sedimentation index (S I ) Thus if the level *of the top of the blood cells falls to 10 after 1¼ hours and to 20 after 2¼ hours* the S I will be the average of 10 and 20 i e 15

## Wassermann Reaction

Lloyd Mitra and Muir (1927) concluded that a positive Wassermann is due to *syphilis in a great majority* of cases and Pineda (1926) contended that the Wassermann reaction is negative in uncomplicated cases Doubt has since been cast on these state *ments and recent* work on the subject at the Lady Willingdon Leprosy Sanatorium Chingleput has tended to confirm these doubts *The work was undertaken according* to the following premise If the earlier statements that a positive Wassermann reaction is due to syphilis complicating the picture and not due to leprosy then all patients with leprosy should show improvement in the Wassermann reaction on treating them for syphilis Ten cases were therefore chosen and treated for syphilis The drug used was that advocated by Muir Hg 33 This is an organic compound of mercury which dissolves in hydnocarpus (chaulmoogra oil) Five of the cases were treated with Hg 33 and five left as controls In the control group two cases both with strongly positive Wassermann and Kahn reactions became negative and *in the treatment group* none The negative result corresponded with marked improvement in the clinical and bacteriological condition and suggests that leprosy was the factor which caused

the positive reaction A further analysis of the patients with positive serum reactions[1] was undertaken and Table X gives the percentage of positive reactions in the various types in the Lady Willingdon Leprosy Sanatorium

TABLE X

| Type | Kahn and W R (positive) | Kahn and W R (doubtful) | Kahn and W R (negative) | Total cases | Percentage of W R (positive) |
|---|---|---|---|---|---|
| L3 | 14 | 4 | 16 | 34 | 41 2 |
| L2 | 36 | 20 | 109 | 165 | 21 8 |
| L1 | 24 | 14 | 161 | 199 | 12 0 |
| Neural of all degrees | 1 | 1 | 20 | 22 | 4 5 |

It will be seen that the positive rate decreases markedly from 41 per cent in the advanced leproma to only 4 5 per cent in the neural group Further in an analysis of twenty four lepromatous cases which were discharged from the Institution four showed a strongly positive Wassermann on admission and when discharged the Wassermann reaction was found to be negative although no anti syphilitic treatment had been given

In our opinion these results give strong support to the theory that a positive Wassermann or Kahn reaction has no significance in leprosy and that physicians are not justified in giving anti syphilitic remedies in leprosy unless there are clinical signs of past or present syphilis or a history of past infection

It should be remembered that both the Wassermann and Kahn reactions need experience in order rightly to be interpreted While the Kahn test is comparatively simple it should be only undertaken under reasonably efficient laboratory conditions and by those who have had sufficient technical experience to enable them not only to carry out the test but to interpret it accurately

**Lepromin Test**

As far back as 1916 Kensuke Mitsuda a Japanese worker devised a skin test in the hope that it would aid in the diagnosis of leprosy This test was first described by him at the Strassbourg Conference (1924) and subsequently taken up by Bargehr (1926) and Rogers (1930) brought the importance of the test to the knowledge of workers Since this date Hayashi (1933) Muir (1933) and others have reported on the test and it is becoming of increasing importance Leprolin or more correctly lepromin is a saline emulsion of leprous material with much of the extraneous tissue material separated and consists chiefly of a suspension of M leprae with a certain proportion of tissue substance It cannot be accurately standardised and therefore the dosage must be an arbitrary one the usual dose is 0 2 c c of the saline bacillary emulsion intradermally

The following is the technique of preparing lepromin adopted at the Lady Willingdon Leprosy Sanatorium and based on the method originally described by Muir (1933)

[1] Seventy f[illegible] per cent of the serum reactions were with Kahn [illegible] remaining [illegible] per cent [illegible] Wassermann [illegible]

Material is obtained by trimming the ears of advanced lepromatous cases with pendulous or nodular ear lobes or by removing large soft nodules elsewhere on the body Several suitable patients should be chosen so that a large amount of material may be collected at one time The cuttings are boiled in water for twenty minutes and divided into fine fragments with a knife or scissors The material is then dried for a few hours under a fan and thereafter in a vacuum desiccator over pure sulphuric acid The dried material is ground up to a fine powder in a glass mortar and stored in a desiccator This forms the stock powder It is important in preparing the powder to make a large amount at one time so as to ensure as far as possible uniform results

In preparing the suspension 0 4 gramme of the dry powder is ground up with 10 c c of saline the fluid suspension is pipetted off the solid residue in the mortar is again ground up with saline and the fluid suspension pipetted off and added to the rest of the suspension this process being repeated three or four times The whole suspension is then shaken up in a large test tube and allowed to sediment for ten minutes after which the fluid is again pipetted off the sediment being discarded Normal saline with 0 5 per cent carbolic acid is added to make 100 c c The suspension is then made up in 1 c c ampoules which are sealed and heated at 120° C for half an hour

It is difficult to standardise lepromin accurately This is shown by making a series of intradermal tests with full strength standard lepromin and dilutions of 1 in 2 1 in 4 1 in 8 While the stronger suspensions give a somewhat stronger reaction the difference in reaction is not in proportion to the difference in dilution 1 in 8 giving a reaction not very much less than full strength For the sake of uniformity however we keep a standard smear of each suspension which has been prepared by spreading out a standard loopful over a given area of slide and the concentration of bacilli compared No attempt at counting the bacilli is made but it is possible to tell whether the numbers are approximately equal By making several such examinations before diluting the suspension it is possible to adjust the strength by adding more or less saline

The thin skin on the anterior aspect of the forearm below the elbow is chosen for inoculation the lepromin being injected The usual dose is 0 2 c c Care should be taken that injection is made into and not under the skin a wheal should rise round the point of inoculation A slight serous effusion appears after the injection and disappears after a few days In positive cases nodules appear at the sites of inoculation between the first and third week and increase gradually in size up to a maximum

The degree of reaction is read by measuring the size of the nodule in millimeters between the blades of a sliding caliper Readings are made after fourteen days and then once a week up to the eighth or tenth week The maximum reading of each nodule is taken as the index The following is a guide to the strength of the reaction

| | |
|---|---|
| Up to 3 mm in diameter | 1+ |
| 3 to 5 mm in diameter | 2+ |
| Above 5 mm in diameter | 3+ |
| Nodule suppurating | 4+ |

It is known that lepromin as prepared by the above method contains not only bacilli and the constituents of a nodule but tissue detritus as well Fernandez (1940) has pointed out that in the lepromin reaction there are two phases one an early reaction which takes place within twenty four to forty eight hours and a delayed reaction which

reaches its maximum in about four weeks. As a result of research work particularly by Lowe and Dharmendra (1943) the fractions which produced the early reaction were isolated and a refined lepromin made. This refined lepromin resulted in an early reaction which could be read within twenty four to forty eight hours and brought the test on a similar basis as the Mantoux test. Lowe and Dharmendra (1943) have disproved the contention that the two reactions are due to different substances or toxins and have shown clearly that the late reaction is due to the slow liberation of the antigen from the breaking down of the bacilli contained in the lepromin. From this these authors went on to isolate the specific fraction and have shown that as in tuberculosis so in leprosy the nucleo protein fraction in the bacilliary emulsion is probably responsible for the specific reaction. For those who are interested in this work and the preparation of the newer refined lepromin they are referred to the original articles by Lowe and Dharmendra.

The question arises whether lepromin is a specific test for leprosy. In this connection it may be pointed out that Cochrane and Fielding (1941) undertook a study of three hundred medical students in Australia and found that all but three cases showed a negative lepromin. One of the three showed a moderately positive reaction; on biopsy of the lesion typical giant and epithelioid cells were seen. In the other two the reaction was slightly positive. Dharmendra and Jaikaria (1943) however showed that with the old lepromin or as Fernandez terms it lepromin integra the percentage of positives in a population free from leprosy was as high as 60 per cent and that with the refined lepromin the percentage was reduced to 3 per cent and expresses the opinion that the work done so far indicates the existence of a specific antigen in the leprosy bacillus. The discrepancy between the results of Cochrane and Fielding and Jaikaria and Dharmendra can probably be explained by the fact that they were dealing with a different racial group.

It is however generally agreed that while the refined lepromin is more accurate because its preparation needs a fully equipped laboratory for all practical purposes lepromin integra or whole lepromin can be used.

**The Significance of the Lepromin Test**

It must be very clearly understood that the lepromin test is neither a diagnostic nor a therapeutic test. As was pointed out in the previous chapter all reactions against the M. lepræ are defensive in nature and that successful defence is shown by the ability of the tissues to anchor the organism and prevent its dissemination from the skin to the reticulo endothelial system. The lepromin test is merely an indication of the actual or potential capacity of the body to put up a successful defence. Therefore as can be expected in all tuberculoid cases the test is positive and its degree of positiveness is in direct proportion to the intensity of the tissue reaction. In all lepromatous cases the reaction is negative. As already indicated there are a group of cases not altogether understood in which the defences of the body are thrown into complete confusion. These cases represent partially successful defence. The lepromin test in these cases shows considerable variation. Most frequently it is negative but during phases of acute exacerbation the test may be slightly to moderately positive which may either become negative in the quiescent phase or less positive. While in all probability this test indicates allergy or potential allergy we prefer to state that a positive lepromin shows successful or potentially successful tissue defence and we

believe that a lepromin reaction (excluding the reaction produced by extraneous tissue material) can only be positive in the presence of a primary focus and therefore is analogous to the Mantoux test This opinion receives support from the observation that we have never succeeded in producing a positive lepromin in a monkey without previously inoculating the animal with a nodule from a patient with leprosy

If then the lepromin reaction represents a positive tissue defence what causes a reaction to be negative? Cochrane Rajagopalan *et al* (1941) showed that (*a*) 86 per cent of the healthy adults examined showed a positive lepromin and 79 6 per cent of healthy children and (*b*) that the degree of positiveness varied according to the type of the cases They further showed that 60 per cent of the so called simple macular and 82 2 per cent of the tuberculoid macular lesions of neural leprosy were positive [1] On analysis of the lepromin reaction in relationship to known history of contact it was shown that the percentage of positive reactions was in direct proportion to the closeness of contact with an open case and the following conclusions were arrived at

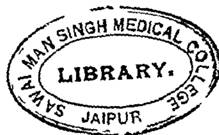
(*a*) In healthy persons the older age group tends to show a higher percentage of positives How far this is due to small subminimal infection with M leprae it is impossible to say owing to the paucity of the numbers and to the absence of information from non endemic areas Is this one of the reasons why adults are less susceptible to leprosy than children?

(*b*) In children the positive reactors appear to decrease as the closeness of contact increases

(*c*) It is our opinion that the more intimate the contact in early life the more likely is cellular resistance to be broken down If it could be established that lepromin negative children more frequently become lepromatous in adult life this would be of help in the campaign against leprosy

In conclusion therefore it may be said that the lepromin test is of value in the prognosis of leprosy but is of no help in its diagnosis A positive lepromin indicates the actual or potential ability of the tissues of the body to put up an effective defence against the M leprae It is of further help in the classification of the disease for it is of some assistance in aiding the clinician in separating the true major tuberculoid lesions from the large group of atypical or border line cases which will be described in a subsequent chapter

[1] For explanation of these terms see Chapter XI



## CHAPTER VI

## SIGNS AND SYMPTOMS

From what has been written in the previous chapters it will be clear to the reader that leprosy naturally falls into two distinct types (i) neural leprosy (ii) lepromatous leprosy In this chapter it is proposed to describe in detail the signs and symptoms of leprosy It should be said at the outset that every practitioner who is faced with the possibility of making a diagnosis of leprosy should only do so after very careful and detailed consideration A useful maxim which should not be forgotten especially when dealing with children is When in doubt never diagnose leprosy It may be thought that if a diagnosis is not made one is condemning the patient to a greater possibility of developing more serious lesions and decreasing the patient s chances of effective recovery In this connection it may be said that there is little evidence to indicate that delayed treatment except in the lepromatous case which should not be missed has any effect on the subsequent progress or retrogression of the disease Further it will be contended in the chapter on the development of the lesions of leprosy that apart from a very limited group the various types of leprosy remain true to type and do not change If in addition one remembers the great tendency for early neural lesions to disappear the statement that one should think many times before diagnosing leprosy appears justified In fact to make statements such as You have suspicious signs of leprosy is not only unjustifiable but definitely harmful for until the outlook towards leprosy is radically changed one must remember the psychological and spiritual distress which is caused when such a diagnosis is made On the other hand when the signs are unequivocal then the diagnosis need not be hidden under pseudonyms such as Hansen s disease Let us treat the patient as an intelligent being not alarm him when there is no need for alarm but when a diagnosis is certain encourage him to adopt a sane and reasonable attitude towards the disease and thus create in him that determination and sanity of outlook which will result in the greatest amount of co operation between the patient and his physician These remarks with regard to diagnosis apply with still more force when a physician is faced with the possibility of leprosy in children

In the light of these statements it is emphasised that a diagnosis of leprosy except in one connection which will be mentioned later is never justified unless one of the two cardinal signs are present

(i) Clinical signs of nerve involvement
(ii) The demonstration of M leprae in the skin and frequently also in the nasal mucous membrane

### I Neural Leprosy (symbol N)

We now pass on to the detailed description of neural leprosy Generally speaking neural leprosy is benign and resistant showing a marked tendency to spontaneous healing and is divided into the following subtypes

(i) Simple macular leprosy (symbol Ns)

(ii) Neural tuberculoid leprosy

(a) Minor tuberculoid (symbol Nt)
(b) Major tuberculoid (symbol NT)

(iii) Neural anaesthetic leprosy (symbol Na)

(i) *Simple Macular Leprosy* (*Neural type*) (Ns)

This type of leprosy manifests itself as single or more usually *multiple hypo pigmented lesions* which are commonly found

(a) on the face
(b) extremities (lateral aspects)
(c) buttocks
(d) scapulae



Fig. 28.—Simple neural lesions showing typical macules on back of arm and shoulder



Fig. 29.—Simple neural lesion showing macule on thigh Note well defined edge

The lesions are hypopigmented (not depigmented) with a well defined edge the edges are definite and show a pronounced demarcation between the affected and healthy skin but are not raised In other words the macules in simple neural leprosy are macules in the dermatological sense In addition the macules especially on the extremities and buttocks usually feel dry to the touch and frequently show in a greater or lesser degree anhydrosis or lack of sweating Associated with the dryness of the lesions there may be particularly on the skin over the tibia a patterned appearance of the skin with slight scaleness indicating irregular cornification or parakeratosis Another characteristic of the hypopigmented lesions of simple macular leprosy is loss of sensation This

may not be seen in all the macules but it is constantly found in some It should be noted that

(*a*) Patches on the face usually show no loss of thermal tactile or pain sensibility

(*b*) Patches on the trunk not infrequently show no anaesthesia to touch but loss of thermal sensibility

(*c*) Patches on the extremities generally show anaesthesia to touch as well as to heat

In this type of leprosy it should be borne in mind that unless lesions on the face are absolutely typical no diagnosis should be made Further the lesions are nearly



Fig 31 —Typical hypopigmented l[illegible] on on the buttock



Fig 31 —Slightly [illegible] infiltrated lesion [illegible] the right knee showing the fine granular appe[illegible] of very early [illegible] leprosy

always multiple and great hesitance should be shown in making a diagnosis unless anaesthesia is definitely present remembering that loss of thermal sensibility is the earliest sign to appear If in doubt a biopsy of the lesions should be made In this connection two points should be borne in mind

(*a*) In taking a biopsy care must be exercised to include in the section a piece of subcutaneous fat It is changes in the corium and in the small subcutaneous nerve which must be seen and unless subcutaneous fat is included it is frequently impossible to make a diagnosis

(*b*) Fix the tissue in Zencker's solution rather than formalin—the latter tends so to distort the cells that it is almost impossible to make an accurate diagnosis

While in many instances the histology of the simple macule is not characteristic if the round celled infiltration is concentrated around hair follicles and vessels in the corium

and the small nerves in the skin are seen to be invaded by the same process then the lesion is most probably one of leprosy If in addition there are foci of epithelioid cells with round celled infiltration then the diagnosis is almost certainly confirmed

(ii) *Neural Tuberculoid Leprosy*

Wade and Lowe have pointed out that the simple macule of neural leprosy is essentially tuberculoid in character That is histologically the same changes are seen the difference being rather a matter of degree than of character

All lesions of tuberculoid leprosy show themselves as raised infiltrated lesions





Fig 3 Fig 33

Early minor tuberculoid lesions Note the pebbling described first by Wade

and therefore are not macules in the dermatological sense They are divided for convenience into two subtypes

(a) Minor tuberculoid
(b) Major tuberculoid

*(a) Minor Tuberculoid (Nt) With regard to the minor tuberculoid division of* neural type leprosy it may be stated that it is generally accepted that all active lesions *of neural leprosy* will show histologically tuberculoid change

The main difference clinically between the simple macule of neural type leprosy and the minor tuberculoid macule is that the former is flat with a definite but not a raised edge and the latter may be raised or at least the periphery is infiltrated The main characteristics of the lesions are as follows

(1) The lesions are usually hypopigmented the edge slightly erythematous always shows a varying degree of infiltration which may be uniform or present a characteristic pebbled appearance
(2) The distribution of the lesions is similar to those of simple macular leprosy

(3) Not infrequently in addition to the lesion being infiltrated if carefully examined the superficial cutaneous nerve supplying the area in which the lesion occurs is found to be enlarged and sometimes tender

(4) Loss of superficial tactile sensation is usually constant accompanied al o by loss of thermal sense and frequently lack of appreciation of pin prick sensation

(5) As a rule lesions of simple macular leprosy as well as those of minor tuberculoid leprosy are negative to standard methods of examination Occasionally and this it is said applies particularly to the African races a few bacilli may be possible of demonstration This emphasises the fact that it is not the presence of the bacilli that determines the clas ification of leprosy but the clinical signs



F 34 —Th l n on th right ch t is a l ghtly [illegible] ted pl q l k lesion



Fig 35 —Res lv ng tuberc l d lesion of m jo degree r ght [illegible]

(b) *Major Tuberculoid* (NT) In essential characteristics there is no difference between major and minor le ions This classification is adopted for convenience but the signs and nature of the lesions are es entially the same the difference i seen in the degree and not in the nature of the changes Major tuberculoid leprosy is seen in individuals in which there is an active and sometimes violent ti sue re ponse on the part of skin and nerves to the pre ence of M leprae The following are the chief clinical signs

(1) Rai ed erythematous and gros ly infiltrated lesions Infiltration is not usually confined to the edge but the whole patch is raised forming a plaque

(2) Edges are well marked and gro ly infiltrated

(3) Loss of tactile thermal and pin prick sen ibility This is frequently seen at the centre which often shows an are i of normal skin

(4) There may be enlargement of any of the superficial nerve Frequently the mall branches of the cutaneous nerves e g the superficial branch of the radial nerve cros ing the lower end of the radius may become enormously

enlarged The enlarged nerve can usually be traced to an erythematous infiltrated lesion although the enlargement may persist long after the patch has disappeared

(5) The distribution is similar to the lesions of neural type leprosy in general It must be remembered that major tuberculoid leprosy invades the so called immune areas more often than the other neural lesions The areas are axilla eyelids vertebral column palms of hand

(6) In major tuberculoid leprosy especially in the more acute forms where there is marked erythema the lesions are usually positive to standard methods of examination but the finding of bacilli is not a reason for any alteration in classification



FIG 36 —Spreading major tuberculoid lesion on back Several enlarged nerves could be palpated



FIG 37 —Major tuberculoid lesion on dorsum of hand Note wrinkled appearance—indication of resolution

(7) It should be borne in mind that major tuberculoid lesions are sometimes unilateral this is frequently so on the face when one side of the face or ear and not the other is affected This is an important point in differentiation between these lesions and the more serious lepromatous lesions which will be shortly described In all major tuberculoid lesions there is a tendency for them to show signs of acute exacerbation *these will be* described in the chapter on reaction in leprosy

(iii) *Neural Anaesthetic Leprosy* (Na)

This subtype of neural leprosy is not so commonly seen in South India as in North India and is that type of leprosy which manifests itself in polyneuritic changes without macular lesions in the skin The lesions appear to be purely neural and as mentioned in the previous chapter are visualised as caused by bacilli passing from the primary focus to the nerves *rather than to the skin* and setting up a fibrous tissue reaction which results in the destruction of the nerve This fibrous tissue reaction is evidently not only confined to the larger nerves but there appears to be a fibrosis of

the nerve-endings in the skin resulting in a true peripheral neuritis. The latter change has never been demonstrated but it is difficult to explain the extensive glove stocking anaesthesia in any other way especially as it is a dissociated anaesthesia and not a complete loss of sensation. Muir and others have suggested that it is a true ascending neuritis but such a theory is a difficult one to prove. Gross changes have not been described in the cord although bacilli have been demonstrated in the anterior horn but these we believe are of no significance. In the field of neurology there is yet much research work to be done into the actual cause of lesions of neural anaesthetic leprosy but this could only be taken up by one well versed in the technique of demon-



Fig 38.—Major tuberculoid lesions showing characteristic healing centre



Fig 39.—Major tuberculoid lesion on buttock showing spontaneous resolution

strating changes in the peripheral nerves and in the nerve-endings of the skin. With these introductory remarks we now pass on to the signs of neural anaesthetic leprosy. These are as follows:

(1) Anaesthesia
(2) Nerve enlargement
(3) Muscular paralysis

(1) *Anaesthesia.* This as has already been indicated is one of the cardinal signs of all neural type leprosy and should be looked for in every case. In neural anaesthetic leprosy loss of sensation is confined to the extremities especially to the areas of distribution of the common peroneal and ulnar nerves although the whole of the foot and leg or hand and arm may be affected giving rise to the well known glove stocking anaesthesia described by Muir. It should be remembered that loss of sensation is usually seen in the following order: thermal, tactile, pain, pressure.

(2) *Nerve Enlargement.* This is most marked in tuberculoid macular leprosy where in addition to gross enlargement of the subcutaneous nerves to the cutaneous

lesions there is *seen marked* enlargement and not infrequently abscess formation in the ulnar common peroneal and great auricular nerves *In neural anaesthetic* leprosy however as a result of a fibrous tissue reaction enlargement of the ulnar and peroneal nerves may be seen In the early stages pain and tenderness are prominent symptoms but later the nerves are reduced to fibrous strands this is due to contraction of the fibrous tissue then the nerve may be actually less thick than normal The amount of sensation lost is dependent on the degree of nerve destruction In the early stages of enlargement and tenderness only anaesthesia to temperature and touch may be present but as fibrosis sets in pressure sensibility—both superficial and deep—is affected It is interesting to note that the deep reflexes such as the knee jerks are never lost and that deep pain is seldom affected neither is joint sense



FIG 40—Major tuberculoid leprosy (Note hand deformity due to accident) Photo taken by the Photography Department General Hospital Madras

(3) *Muscular Paralysis Paresis and Wasting* Accompanying the enlargement of the ulnar and common peroneal or *later* due to secondary fibrosis the characteristic wasting of the hand as *seen in claw hand* is a common sign A similar wasting of the muscles supplied *by the common peroneal is noted with* accompanying drop foot In addition the VIIth *nerve is not infrequently involved* resulting in facial *paralysis and lagoph* thalmos Accompanying VIIth nerve involvement Vth nerve lesions may be seen in anaesthesia of the cornea In passing it may be said that both drop foot and facial paralysis seldom recover but by judicious exercise and massage and by *preventing disuse atrophy* a *considerable* amelioration of symptoms due to claw hand can be effected

*Trophic Conditions* Neural anaesthetic leprosy is one of the diseases which *show marked trophic changes* These are all due to nerve involvement leading to the alteration of the vascular supply to the limbs *and also partly the result of pathological* changes *in the* arteries and veins especially the veins resulting in disturbances of nutrition producing a local loss of calcium *The earliest lesions seen* are frequently in the form of idiopathic blisters or injuries due to the fact that patients do not appreciate pain from burns or slight injuries It is interesting to note that osteoporosis is noted without trophic ulceration and in cases showing claw hand rarefaction of the phalanges and metacarpals may be seen this may go on to actual bony absorption as is witnessed by the fact that in such cases traces of the finger nails can be demonstrated on the shortened stumps It is our opinion that actual necrosis of bones and signs of periostitis and irregular ossification are never seen in leprosy apart from sepsis resulting from trophic *ulceration*

The trophic ulcer is a well known condition and is seen in leprosy diabetes and syphilis but in the latter two conditions bone is seldom so *extensively involved* We

believe that all trophic ulcers commence from injury this may be so slight as hardly to be noticed but in an anaesthetic foot it is sufficient to cause pathological changes The commonest site for trophic ulceration is the heads of the metatarsal bones especially the first and fifth As a result of pressure areas of cornification are seen and later a definite ulcer forms which gradually extends down to the bone Sepsis results and bony necrosis sets in Trophic ulceration of the toes is also frequently seen as a result of injuries—e g from closely fitting shoes or injuries from stones and again these become septic and result in necrosis of phalanges subsequent sequestra formation and extrusion of the dead bone through the ulcer The larger bones such as the metatarsal may be affected causing extensive trophic ulcerations which do not heal until the whole bone is removed It is interesting to note that while the phalanges of the hand are frequently



Fi 41 —Major tul r loi l l p o y n b k of rigl t f re rm \ te tl n kedly nfltr ted edge



Fig 4* —Tube l l les n on l ft cl eek l w ng t l rg n ent of gre t l n r e

found to be necrotic necrosis is seldom seen in the metacarpal bones This is because the e are far less liable to injury than the metatarsal bones The e latter along with the tarsal bones are exposed to injury because they have to bear the whole weight of the body as in walking and standing

Occasionally both the phalanges and metatarsal bones escape involvement and the tarsal bones are affected This usually results from trophic ulceration of the heel leading to necrosis of the os calcis The trophic condition may extend and a condition similar to a Charcot s joint is seen

Neural anaesthetic leprosy is one of the most mutilating forms of leprosy and while the bacilli cannot be demonstrated by standard methods of examination yet the resultant fibrosis of the nerves may give rise to extensive changes and may cause not only advanced trophic changes but double facial paralysis corneal ulceration drop foot and marked muscular wasting giving rise to one of the most pathetic sights in the whole realm of chronic diseases

The reader in studying this chapter on signs of neural leprosy will realise that simple macular leprosy as well as tuberculoid macular leprosy may be accompanied by anaesthesia of the extremities with muscular paralysis—e g claw hand and drop foot and trophic ulceration While these last signs are particularly noted in neural anaesthetic leprosy in classifying neural leprosy we reserve the designation neural anaesthetic leprosy only to those cases which show polyneuritic changes without accompanying skin lesions Where such lesions are seen associated with macules then the classification is determined according to the nature of the macules whether they are of a simple neural or tuberculoid type

In passing it might be noted that the word macule is used in the broad sense by leprologists and not confined only to lesions not raised above the surface If the term macule were used according to the strict dermatological usage the classification of leprosy would become altogether too complicated



FIG 43 — Major tuberculoid leprosy Plaque like lesion on the left back One or two of the smaller lesions are nodular but retain the flat topped characteristics of major tuberculoid leprosy

It probably would be more in keeping with modern dermatological opinion if the term macule were reserved for the simple neural lesion and the term lepride were used for all tuberculoid lesions for the latter lesions histologically are in the nature of leprides and somewhat comparable as Wade has pointed out to the tuberculide and syphilide However it has been felt that the standard classification laid down at the Cairo Conference (1938) still represents to date the most satisfactory description of neural leprosy and therefore this has been closely followed

The School of Tropical Medicine Calcutta adopt a modification of the Cairo Conference classification All neural lesions which show macules are classified as neuro macular lesions and are designated by the symbol Nm If there are polyneuritic signs in addition the suffix a is attached and so neural lesions with macules and polyneuritic signs would be designated Nma and pure neural anaesthetic cases would remain with the designation Na The term neuro macular as a separate classification has not been recommended by the Cairo Conference therefore we have not followed this classification Further we feel it is important to differentiate between simple neural lesions and neural tuberculoid lesions and therefore are of opinion that the description of the neural lesions as above described is the simplest and the most practical

## II Lepromatous Leprosy (non-resistant or malignant) (symbol L)

Previous to the Cairo Conference (1938) the nomenclature of this type of leprosy was not satisfactory Prior to the rediscovery of the Chaulmoogra derivatives this type went under the general name of nodular leprosy Muir and Rogers called it

cutaneous leprosy. Neither of these terms however were satisfactory, the former because nodules are only a late manifestation of this type of leprosy, the latter because cutaneous signs are not solely confined to cutaneous leprosy but also occur in neural leprosy. For these reasons the Cairo Conference (1938) classified this type of leprosy under the general name lepromatous. This designation is more satisfactory for it recognises the basic histology of the lesions, the presence of lepra cells and indicates that this type is serious and non resistant. Further characteristics of lepromatous leprosy are that it is always positive to standard methods of bacteriological examination and all cases show a lepromin negative reaction. The Cairo Conference did not further subdivide lepromatous leprosy because it was felt that in contrast to neural leprosy



Fig. 44. [illegible] of secondary neural leprosy [illegible] absorption of phalanges. Note [illegible] shortened [illegible] fingers of [illegible] hand.

there were no true or distinct subtypes. While we believe this to be the case, yet there is still a great deal of confusion as to the forms and varieties of lepromatous leprosy, and we believe that while all lepromatous leprosy is essentially the same, that is clinical phases of this type tend to pass into each other, yet certain varieties seem to have a better prognostic significance than others. But not until a much more detailed study of lepromatous leprosy is made will it be possible further to unravel the tangle which we feel still surrounds the various manifestations of lepromatous leprosy. It may however be said that leproma clinically falls into the following subdivisions:

(a) Macular lepromatous leprosy
(b) Diffuse lepromatous leprosy
(c) Infiltrative lepromatous leprosy
(d) Nodular lepromatous leprosy

(a) *Macular Lepromatous Leprosy*

When the question of the development of lesions of leprosy is under discussion it will be pointed out that it is our belief that lepromatous leprosy does not commence as lepromatous but generally develops either from certain simple macules of neural type leprosy or from for want of a better term what might be called the prelepromatous macules which we believe in especially children are a definite clinical entity and have been styled incipient lesions of childhood Macular lepromatous leprosy then shows itself in the form of multiple hypopigmented erythematous and usually slightly infiltrated macules These macules vary from those described under neural leprosy in three important aspects

(i) distribution
(ii) size
(iii) appearance

(i) *Distribution* The simple macular lesions of lepromatous leprosy show no tendency to be largely confined to the face buttocks outer aspect of extremities scapulae but are usually diffusely distributed over the body

(ii) *Size* Generally speaking the lesions of simple macular leprosy are smaller and very much more numerous

(iii) *Appearance* In the macules of lepromatous leprosy the periphery is not well marked but fades imperceptibly into the surrounding skin In other words unlike the simple neural macule *there is no marked demarcation between the normal skin and* the affected skin of the macule Further while the simple macule of neural leprosy tends to be dry and of a different texture and may show anhydrosis the lepromatous macules on the other hand show no difference in texture from the normal skin exhibit no lack of sweating and have in addition a slightly shiny (erythematous) appearance Although the infiltration is not obvious on careful examination these macules usually show some degree of infiltration although it may be very slight The indefiniteness of the edge and the lack of tissue reaction results in no marked colour contrast between the affected and normal skin Frequently owing to slight erythema these lesions are better seen in an oblique *but bright light when occasionally the macules* appear greasy looking The simple macule of lepromatous leprosy is always positive to standard *methods of examination* Owing to the vagueness of the lesions and the indistinctness of the periphery these lesions are much more difficult to recognise than the macules of simple neural leprosy

(b) *Diffuse Lepromatous Leprosy*

While it has been held that this is a true type of lepromatous leprosy we are of opinion that diffuse lepromatous leprosy is usually the result of the gradual coalescing of the numerous vague macules of macular lepromatous leprosy *until the whole skin* is involved in a generalised lepromatous infiltration These cases in the earlier stages are very difficult to detect because no actual lesions are demonstrable The skin generally has a shiny appearance and there is slight infiltration but this is more easily appreciated by touch rather than by sight the infiltration is better detected by picking up the skin of the back between the fingers In such cases when examined carefully signs slightly more definite are usually found on the face The ear lobes are usually



Fig. 45



Fig. 46

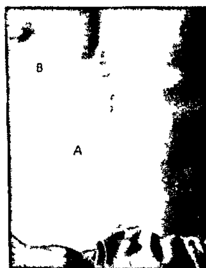



Fig. 47



Fig. 48

Les on of macula l promato leprosy (Not the n lt pl ts of the les ns, the in list n tness of th periphery n l th r l trl t A B placed in th centre of th maculeson l est a l al l nen

slightly thickened and shiny and the eyebrows may *show some thinning* or loss of hair It is however to be remembered that loss of the eyebrows is a late sign in lepromatous leprosy The ear *lobes are not infrequently* quite markedly thickened when the lesions are much less conspicuous elsewhere and it is wise to ask the patient to turn round and stand straight for thickening and slight nodulations of the ear lobes can often best be appreciated by standing facing the patient s back

## (c) *Infiltrative Lepromatous Leprosy*

Lepromatous leprosy as will now be realised may show itself in macules diffuse infiltration areas of marked *infiltration or nodules and infiltrative* lepromatous leprosy is merely a more advanced stage of macular lepromatous leprosy The infiltration may appear in the hypopigmented patches or develop in the skin which shows diffuse lepromatous leprosy The characteristics of leproma remain that is the edges while raised do not stand out as in tuberculoid leprosy but gradually shade off into the *surrounding* skin and do not show the sharp line of demarcation of neural *leprosy Further the infiltration is not of a* whip cord like feel but is much softer or as Wade describes it more succulent These points are worthy of mention because for those with little experience such differences need to be described for confusion in classification can arise if one does not carefully observe the type and nature of the infiltration It must be remembered that the infiltration of lepromatous leprosy may *show great variation of consistence* texture and in the lighter races colour and therefore the *clinician is advised carefully to study the varying* clinical manifestations



FIG 49 —Macular lepromatous leprosy showing activity of lesions—raised and erythematous—but the edge of the lesion tends to be less marked than the centre

## (d) *Nodular Lepromatous Leprosy*

Nodular leprosy we believe does not arise *per se* but always is the result of progressive deterioration of the macular diffuse or infiltrative forms of lepromatous leprosy *In the earlier stages* nodules appear first on the ears later as the disease advances they may appear anywhere on the body and are commonly seen on the extremities especially *the elbows fingers over* the joints and sometimes on the genitals in the male and on the vulva in the female By the time the lepromatous leprosy has become so advanced *as to reach the nodular stage* diagnosis should no longer be in doubt At first many of the nodules tend not to be fixed to the skin and are movable in the subcutaneous tissues but later they *become fixed* and are *liable to ulcerate* it is the ulcerating nodular case which presents a very great problem in nursing

In lepromatous leprosy the nasal mucosa is frequently *positive to standard* methods of examination and nasal as well as eye lesions are a common complication A detailed description of these lesions will be given in a later chapter While some



Fig. 50



Fig. 51

Diffuse lepromatous leprosy. Note lepromas on the back and the loss of eyebrows in Fig. 51



Fig. 52



Fig. 53

Infiltrative lepromatous leprosy. Note the periphery fading into the surrounding skin in contrast with infiltration in tuberculoid leprosy (see Figs. 36-43)

authorities state that the scalp is not affected in leprosy in certain races particularly the Mongolian and European a leprous alopecia is sometimes seen The whole of the hair of the head falls out except a thin line of hair following the great vessels of the scalp—temporal and occipital In addition actual nodules may form on the scalp itself

In the above description of lepromatous leprosy no mention has been made of neural signs Just as neural leprosy is not only confined to the nerves but shows cutaneous lesions so lepromatous leprosy is not solely confined to the skin The nerves *are invariably involved* in lepromatous leprosy that is if carefully examined e g scrapings actually taken from nerve sheaths—the bacilli can be found inside the nerve bundles As explained however in the chapter on Pathology these bacilli lie within the nerve sheath *without at first causing much damage* and frequently no loss of



FIG 54

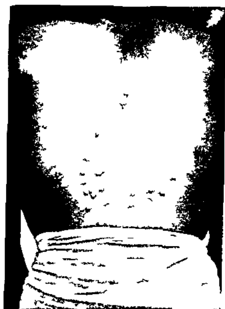


FIG 55

Nodular leprom to s leprosy

sensation can be detected The bacilli however ultimately act as foreign bodies first causing some swelling and oedema of the nerve and this later results in an interstitial fibrosis *therefore frequently in lepromatous leprosy* depending on the amount of pressure as a result of oedema or fibrosis nerve fibres are affected and are liable to be destroyed anaesthesia is then elicited and this as in neural leprosy usually involves the distribution of the common peroneal or ulnar nerves As the disease progresses lepromatous leprosy shows both neural and cutaneous signs the word mixed however is not used first because all leprosy is essentially mixed that is there are both nerve and skin manifestations in neural as well as lepromatous leprosy the neural anaesthetic case being an exception Again mixed leprosy is not a separate clinical entity or a different type and therefore if a case is lepromatous it is classified as such without reference to neural involvement but in symbolising the classification the letter N is added to indicate the neural as well as the lepromatous elements

## Secondary Neural Leprosy

As far back as the latter part of the nineteenth century Hansen Impey and others recognised the self healing nature of leprosy and Muir likened the course of leprosy to a parabolic curve commencing at the base line with neural leprosy passing through to the lepromatous stage reaching a peak and then gradually the bacilli disappear from the skin and finally reaching the base line again and as Muir termed it burning out leaving residual gross nerve lesions While it is perfectly true to state that leprosy is a self healing disease it is not correct we believe to visualise the disease normally passing from the neural stage to the lepromatous and finally burning out as an advanced neural case It is our conviction that the various types of leprosy as a rule remain true to type that is neural remains neural except for a small group of cases which will be referred to in a later chapter and lepromatous leprosy starts with what may be termed the prelepromatous macule which passes gradually into fully developed lepromatous leprosy In the great majority of instances however lepromatous leprosy except when it is arrested either as a result of treatment or much more rarely spontaneously remains lepromatous throughout life While one states this it must be remembered that as lepromatous leprosy advances so the resultant interstitial fibrosis in the nerves increases and thus as the disease progresses more and more advanced signs are seen and deformities absorption of bones and more rarely paralysis may all be an accompaniment of lepromatous leprosy In a few instances however as the secondary nerve signs develop the bacilli begin to disappear from the skin and the skin lesions become flattened leaving a wrinkled or as Muir termed it tissue paper appearance of the skin and gross nerve deformity It is these cases which are termed secondary neural leprosy There has never been any adequate explanation as to why the bacilli disappear from the skin



FIG 6 —D ff e l p oma gradually pa ing into th infilt ative and nodula t ge Note the not uncomm n freedom f le ons on th h t a ompared with the face



FI 57 —N bundl unin ded but h w llul act n b tween the bundle wh h b ome o gan d nt fibr us t ssue ( nterst ti l fib o ) This type of llula a t on occurs ea ly in n u l ana e th t l p o y It al a late act n l p m to s l p y (× 00)

It is our belief that there must be some alteration in the biochemical or biophysical state of the skin which effects its nutrition and as a result the bacilli can no longer multiply in the skin therefore the disease as we have said ceases to progress because we believe that leprosy can only develop as a result of the bacilli passing from the primary focus to the skin and then throughout the reticulo endothelial system Some support is given to this statement (1) because bacilli have been described in internal organs after they have disappeared from the skin (2) because if a patient is starved almost to the point of death or becomes emaciated and cachectic bacilli tend to disappear from the skin only to reappear if the nutrition of the skin returns more nearly to normal




CHAPTER VII

# CLASSIFICATION AND TECHNIQUE OF EXAMINATION

It is unnecessary to review the history of the various attempts at classification It is sufficient to mention the fact that the present classification is primarily a clinical one In classifying a case the more important conditions are noted for instance a simple macular case may show polyneuritic signs but in so far as the most obvious and prominent lesions are the hypopigmented patches it would be placed in the simple neural category Again it must be borne in mind that the present classification is still an interim one and therefore it is not always easy definitely to label every case Hence the histological examination and the lepromin test are useful adjuncts to classification but must only be used as aids and not as a basis for classification

## The Classification of Leprosy Abstracted from the Report of the Sub committee on Classification (Cairo Conference 1938)

The problems of classification of cases of leprosy should be viewed broadly bearing in mind both (a) the requirements and circumstances of work of the practical field worker to whom classification is necessary for purpo es of prognosis treatment or control but who cannot apply elaborate or time consuming methods of differentiating type of the disease and (b) the refinements of such differentiation that are possible to the specialist who employs special methods of investigation The great majority of persons who deal with leprosy work under circumstances that require that the basic or primary classification be as simple as possible

Progress in knowledge of the forms of leprosy and of the nature of the leprous processes has been made since the classification that is now most generally used was adopted by the Leonard Wood Memorial Conference on Leprosy in 1931 and it is now possible to modify some of the terms of that classification to eliminate certain causes of misunderstanding However our knowledge of the matter has not yet progressed to a point where it is possible to attain unanimity of opinion on certain essential features

It is recommended that for the present the basic division of leprosy into two types along the lines laid down in the Memorial Conference classification be continued until such time as further study of the matter permits the attainment of unanimity It is further recommended that future research be in the direction indicated by the questions raised by the minority of this Committee the main questions being whether or not the neural type of the Memorial Conference classification should be divided into two distinct main types simple neural and tuberculoid For the present it is the predominant opinion that such divisions should be considered as subtypes or varieties

Objections have repeatedly been raised to both of the current names of the two types (i e neural and cutaneous ) because of confusion arising from the special sense in which they are employed in leprosy classification on account of difficulties of translating them into other languages and for other reasons However no other

words have been proposed which are free from similar objections It is the opinion of the Committee (a) That for the time being at least the word neural should be retained for the type to which it is now applied (b) that because cutaneous has proved particularly confusing its use should be discontinued and replaced by the term lepromatous the symbol of which is L

It is proposed that the definition of the two types of the Memorial Conference classification be amended as follows

## PRIMARY CLASSIFICATION

**Neural (N) Type**

All cases of the benign form of leprosy with disturbances of polyneuritic nature (i e alterations of peripheral sensation trophic disturbances atrophies and paralyses and their sequelae) or macules of non lepromatous nature (i e leprides usually with localised sensory disturbances) or both These cases give evidence of relative resistance to the infection are of relatively good prognosis as regards life although mutilation may take place and usually react positively to leprolin[1] Bacteriologically the skin lesions are typically but not invariably found negative by standard methods of examination though the nasal mucosa may be found positive Many of these lesions are histologically of tuberculoid nature

**Lepromatous (L) Type**

All cases of the malignant form of leprosy relatively non resistant and of poor prognosis usually negative to lepromin exhibiting lepromatous lesions of the skin and other organs especially the nerve trunks Bacteriological examination usually reveals abundant bacilli Disturbances of polyneuritic nature may or may not be present they are usually absent in the earlier stages and present in the later stages of primarily lepromatous cases and often present in cases arising secondarily from the neural form

## SUBCLASSIFICATION

Subdivision of the types of leprosy may be made from two points of view (a) with respect to the degrees of advancement of the disease and (b) with respect to the forms or varieties of cases within a type (i e subtypes) based on the nature of the lesions The former method of subdivision is that of the Memorial Conference classification and it has proved useful in the hands of many workers especially in dealing broadly with large numbers of cases The latter method of subdivision is generally employed in dealing more precisely with individual cases Both methods have their uses and should be understood but a generally applicable practical formula for combining the two has not been arrived at The two methods are dealt with independently

**I General Subclassification** (by degrees of advancement)

The following specifications are unavoidably somewhat crude but they indicate in a general way the basis of the division into three degrees of advancement of each type

[1] Now termed lepromin

*Neural* 1 (N1)

Slight neural This includes (a) cases with from one to several mall macules or a proportionally smaller number of larger macules whether flat or elevated without indications of polyneuritic changes or (b) cases presenting only polyneuritic changes of slight degree disturbances of peripheral sensation affecting one or two extremities not of marked extent with only minor trophic disturbances muscular atrophy or paresis if any or (c) cases showing combinations of macular and polyneuritic manifestations in equivalent degree of total affection

*Neural* 2 (N2)

Moderately advanced neural This includes (a) cases with fairly numerous or large macules of wide distribution without evidence of polyneuritic changes or with such manifestations of fairly slight degree or (b) cases presenting only polyneuritic changes of moderate degree peripheral anaesthesia of considerable extent if affecting only one extremity or less extent if affecting more than one and moderate trophic changes atrophies and paralyses including beginning contractures of limited extent or (c) cases showing combinations of equivalent total degree

*Neural* 3 (N3)

Advanced neural This includes (a) cases with very numerous or very extensive macular lesions of the more marked kinds with polyneuritic changes or (b) cases presenting only advanced polyneuritic changes extensive peripheral anaesthesia and more or less marked motor and trophic disturbances paralyses atrophies contractures trophic ulcers and mutilations or (c) cases showing combinations of equivalent total degree

*Lepromatous* 1 (L1)

Slight lepromatous Cases with lepromatous skin lesions consisting of one or a few macular areas or a few small infiltrated patches or small nodules or diffuse lepromatous changes of slight degree lesions of the nasal mucous membrane are usually absent

*Lepromatous* 2 (L2)

Moderately advanced lepromatous Cases with numerous macular areas or fairly numerous small or fewer large infiltrations or nodules or diffuse lepromatous changes of moderate degree lesions of the nasal mucous membrane are frequently present

*Lepromatous* 3 (L3)

Advanced lepromatous Cases with numerous and extensive or very marked lepromatous lesions which may vary in their stage of development or retrogression lesions of the nasal mucous membrane are almost always present

*Mixed Cases*

Recognition should not be given to mixed leprosy as a type However cases of the lepromatous type usually exhibit sooner or later varying degrees of polyneuritic involvement and for precision such mixed or complete cases may be designated

LN The symbol L should be given precedence, regardless of the original nature of the case or the relative severity of the two elements because of the predominant importance of the lepromatous element In grading the degree of advancement of these cases the appropriate figure is placed after each symbol e g L2–N1 or L1–N3

*Secondary Neural Cases*

Cases that have previously been of the lepromatous type with polyneuritic features (mixed cases) but in which the lepromatous lesions have resolved leaving only the polyneuritic manifestations are called secondary neural



Fig 58 —Advanced lepromatous leprosy Note inability to close eyes due to lagophthalmus



Fig 59 —The all too frequent termination of advanced lepromatous leprosy—blind and mutilated a caricature of his former self but still a man with a living soul

***II Special Subclassification** (according to the nature of the lesions present)*

(1) *Lepromatous Type*

No varieties of the lepromatous type of leprosy have been established that are sufficiently distinct frequent and general in occurrence to require recognition in formal classification In some places (e g India) where many cases show at least for a time extensive diffuse involvement of the skin not localised in macules or infiltrations there might be an advantage in distinguishing such cases (which might be indicated by the symbol Ld) but it is not certain that this division would be generally useful

(2) *Neural Type*

The neural type of leprosy may be divided into two main subtypes namely anaesthetic and macular For some purposes such subclassification may be sufficient However for more exact work the macular variety should be divided

into simple and tuberculoid and the latter may be further divided into minor and major forms For such work therefore the following is propo ed

NEURAL (TYPE)

Anaesthetic (non macular polyneuritic) (Na)
Simple macular (with flat macules) (Ns)
Tuberculoid macular (minor and major) (Nt)

*Anaesthetic* This variety of neural leprosy presents evidence of involvement of nerve trunks only (polyneuritic changes and sequelae) without macular skin lesions

*Simple Macular* The simple macular cases which comprise a considerable proportion of those encountered present skin lesions (leprides) that have no or only very slight elevation or palpable infiltration When elevation is present it is often difficult to detect it in diffuse light and the surface is smooth not granular or pebbled in appearance such elevation is usually limited to a narrow marginal zone Residual lesions which are without elevation and therefore are simple under this definition (though they may be affected by scarring) should not be considered as a separate variety

*Tuberculoid Macular* This subtype as stated may be divided into two groups which are here described separately

(a) *Minor Tuberculoid* The lesions so designated are the less marked ones of the kind that has become generally recognised to be histologically tuberculoid and that is clinically recognisable as such with certainty These lesions show definite elevation of characteristic appearance though there are considerable variations They are usually marked by irregularity of the surface due to the essentially focal nature and superficial location of the tuberculoid process That condition may produce elevated bands or areas which may be continuous or discontinuous even to the point of producing isolated papulations Occasionally the process is relatively deep in the dermis in which case the surface may be relatively smooth and the appearance may therefore approach that of some of the major tuberculoid lesions but the degree of the condition is less than in that form

(b) *Major Tuberculoid* The lesions so designated are the more striking grossly elevated ones to which recognition as tuberculoid has been largely confined in the past They are major both in degree and nature of the pathological process Typically the process invades the deeper layers of the skin to a marked degree and also the subcutaneous tissue and by further extension in the cutaneous nerves related to the macules it may produce gross involvement of them Macules of this variety are those most liable to be mistaken for lepromata especially when they are (*a*) small but thick morphologically nodular (*b*) in a reaction condition reddish turgid and smooth or (*c*) bacteriologically positive One feature that helps to differentiate them is their typically sharp demarcation and frequently asymmetrical distribution Another occasional feature is the tendency to the development of marked enlargement of the local cutaneous nerves which condition sometimes extends to the main trunks of an affected extremity thus introducing a secondary polyneuritic element A point of importance is the frequency with which these lesions start abruptly as a reaction condition and the relative rapidity—and sometimes the completeness—with which they may subside (Report of International Congress held in Cairo in 1938)

*Technique of Examination*

It cannot be too strongly emphasised that correctly to diagnose and classify leprosy the technique of examination that one adopts must be accurate In establishing a diagnosis and especially in determining the classification of leprosy the principles of general medicine stand firstly one must train one s powers of observation secondly one must use correct laboratory methods remembering these methods are used to confirm a diagnosis and not to make one for the diagnosis is made on clinical signs

Firstly as regards the technique of examination always see that the patient is seen in a good light and males should as far as possible be examined with all clothes off except for a loin cloth Women should be examined with equal care and all areas systematically seen including the buttocks

Secondly with regard to examining for anaesthesia with care this can be done in most cases even in quite young children In persons who are uneducated whose mental processes are slow it may not always be possible to ascertain the extent of the anaesthesia on the first occasion but with patience few will find it difficult to understand what the physician wants

In testing for anaesthesia a feather is the most useful thing to use for it is tactile and not pressure sense that is to be tested First demonstrate on your assistant what you want the patient to do or have your assistant test for anaesthesia on yourself Never ask a patient whether he feels always get him to point out the place touched If the patient fails to recognise the place go over it a second or third time to make sure that there is no mistake Give a child frequent rests if you think the examination will be prolonged for a child gets fatigued easily With regard to the examination of nerves never ask a patient whether a nerve is painful but look at the patient s face A twitch of the facial muscles will indicate that the nerve is tender Never squeeze a nerve firmly it is not necessary and if the nerve is acutely tender as it frequently is you may so frighten the patient that he will not allow you to examine him Roll the enlarged nerve under your finger and this gentle pressure will be enough for you to determine the size of the nerve and will also elicit tenderness if present Remember always to examine the corresponding nerve on the other side it is never safe to pronounce a nerve enlarged without comparing the one on the other side Gross enlargement of course is obvious but it is quite striking the number of times cases which are diagnosed as leprosy with a remark that the ulnar nerve is enlarged and yet one can find no such enlargement A good general rule is if in doubt the nerve is not enlarged In testing for anaesthesia test systematically any visible patches on the extremities trunk and face—although as pointed out the latter area seldom loses touch sense It may be necessary to test for heat and cold for this is not infrequently absent when tactile sense is present

In making a diagnosis of leprosy it is essential to take skin smears to ascertain whether M leprae are present in demonstrable numbers The technique of taking smears has now become uniform the older methods of puncturing the skin with a needle and squeezing blood and serum on to a slide or by excision of a piece of tissue with a pair of scissors curved on the flat are entirely superseded by a method which has been practised in the Philippine Islands for years The following is a description by Wade (1935) of the technique of taking smears

(1) Cleanse the area to be examined by rubbing briefly though vigorously with a small cotton wool sponge with spirit. Wipe dry with cotton wool.

(2) Pinch up the skin in fold, applying enough compression to stop or minimise bleeding. When it cannot be actually picked up, compress it laterally as much as possible.

(3) With a properly cleansed scalpel of suitable style and size make a small but real cut 5 mm or so long and deep enough (about 2 mm) to get well into the infiltrated layer.

(4) If blood or lymph exudes in any quantity wipe it off. With the knife blade turned transversely to the line of cut, scrape the side and bottom of the cut repeatedly and with sufficient vigour to obtain a little actual tissue pulp from below the epidermis.



Fig 60 —Picking up the skin between the fingers and exerting pressure



Fig 61 —While still exerting pressure the incision is made down to the depth

(5) With the knife transfer the small amount of material obtained to a microscopic slide and make a uniform and moderately thick smear over a small area. Multiple smears from the same patient are best put on to a single slide.

(6) For after treatment of the cut the patient is simply given a bit of cotton wool to compress it until oozing stops. No dressing is necessary.

*In addition to taking a smear from lesions in the skin a nasal smear should also be taken.* The technique is as follows:

In a good light a blunt but narrow bladed scalpel is introduced and the internal septum is scraped sufficiently to remove a small piece of mucous membrane and this is transferred on to a slide and teased out so that a uniform smear is obtained. It is sometimes preferable to use a speculum where there is doubt or when examination reveals a definite lesion in the nose.

The instrument we use for taking nasal smears, which was suggested by Wade of the Philippine Islands, is a paper clip straightened out and the end hammered sufficiently to form a small scoop. This is then fixed into a piece of wood or bamboo to act as a handle and forms a very convenient inexpensive instrument for the purpose.

It is wise so that the risk of transferring bacilli from one slide to another is minimised always to spirit and flame the knife or other instrument before taking smears from another case and if possible keep one knife and nasal scraper for the examination of neural cases and another for lepromatous The question now arises as to how many smears should be taken from a patient For diagnostic purposes a comparatively few need to be taken but the old advice of a nasal scraping and smears from ear lobes is not sufficient The routine we adopt is as follows smears are taken from the ears forehead chin cheeks and half a dozen smears taken from suspicious lesions When deciding to take smears always examine in a good light and take smears from the edge rather than towards the centre of the lesions Smears from the buttocks should always be taken for as the late Dr G B Archer pointed out the skin of the buttocks is frequently positive and may remain so after all other lesions have become negative



FIG 6 —The base of the incision is scraped still maintaining pressure

Finally before completing the description of the technique of examination it should be borne in mind that the nose is very seldom the primary source of infection In fact it is doubtful whether a bacillus bearing lesion in the nose is ever found without corresponding lesions in the skin *In examining and staining smears* it should be remembered that these should not be too thick and bits of debris from the nose or skin should be removed carefully for such material is seldom decolourised and not only makes the slide messy but may confuse the picture As a rule it is not necessary to decolourise with acid and alcohol except in smears taken from nasal lesions for acid fast saprophytes sometimes cause great *confusion* These *however are not alcohol* fast and therefore if in doubt decolourise with alcohol as well as acid It will be found that in the case of acid fast saprophytes these lose their stain in the presence of alcohol This *is an important* point because on more than one occasion cases have been sent with a diagnosis of leprosy on a positive nasal smear alone *With regard to staining* we usually find especially when there are numerous smears to *examine that it* is best to immerse the slides in a glass jar for twenty minutes *at room temperature* rather than heat the slides The latter method is tedious if there are many slides and difficult not to leave deposits of stain on the slide as the result of over heating

In examining smears it is well to remember that when in doubt the organism is probably not M leprae A slide should not be declared negative unless at least 200 fields have been examined It is useful to have some criterion as to the degree of positiveness of a slide and the following standard has been adopted at the Lady Willingdon Leprosy Sanatorium Chingleput *Madras Presidency*

6+ Every field full of acid fast bacilli with many globi and intracellular forms
5+ Every field full of bacilli with a few globi and intracellular forms

4+ Bacilli in every microscopic field examined
3+ Bacilli are not found in every microscopic field ignoring single bacilli a group or groups of bacilli are found on an average in at least 10 per cent of the fields examined
2+ Ignoring single bacilli a group or groups of bacilli are found on an average in at least 4 per cent of the fields examined
1+ Ignoring single bacilli a group or groups of bacilli are found on an average in at least 2 per cent of the fields examined

When a smear is less than 4+ a note as to the nature of the bacilli whether they are granular beaded or breaking up should be noted No slide should be declared positive on the presence of one bacillus Without great experience it is extremely



Fig 63 —Transferring the smear taken from the skin to the slide



Fig 64 —Arrangement of multiple smears on the slide to facilitate rapidity of examination and economy of slides

difficult to make a diagnosis on a single bacillus When a smear is less than 1+ especially in cases where the patient was previously negative a report indicating that there are occasional bacilli seen or that a few granules or beaded forms were detected is justifiable

The following is a brief description of the methods followed at the Lady Willingdon Leprosy Sanatorium and may be helpful in reminding readers of the technique of staining slides Prepare the following reagent as a stock solution

(1) *Solution A* 10 grm of basic or carbol fuchsin in 90 c c of absolute alcohol or rectified spirit Grind filter and keep in a separate bottle
(2) *Solution B* 5 c c of carbolic acid in 95 c c of distilled water Keep this in a separate bottle
Mix 1 c c of solution A with 9 c c of solution *B* This is called the staining solution

*Method*

(*a*) Pour the stain on the slide with the smears on and allow it to remain for 15–20 minutes If there are a number of slides then immerse them in a staining jar containing the solution for this period Wash well with running water

(*b*) Decolourise by either immersing the slides in a staining jar with 15 per cent sulphuric acid for a few seconds or by pouring acid over the slide and washing with running water The smears now regain a faint pink tint If the colour is still distinctly red the decolouration is insufficient and acid must be reapplied Wash well with running water

(*c*) Counter stain with 10 per cent methylene blue for 3–4 minutes Then wash and leave to dry

The slide should now be examined with an oil immersion lens

## CHAPTER VIII

# ATYPICAL LESIONS AND THE DEVELOPMENT OF LESIONS

SINCE the Cairo Conference (1938) it has increasingly been borne upon us that the classification of leprosy as set out is incomplete for it does not give recognition to what we believe are important lesions We are of opinion that these lesions must be given a place as separate clinical entities but until this is universally recognised it is preferable to refer to them here and not incorporate them into a generally accepted classification

### 1 The Prelepromatous Maculae or Incipient Lesion of Childhood

While this type was not included in the Cairo classification (1938) it has been recognised for some considerable time Chiyuto and Rodriguez (1935) referred to these lesions as hazy patches Muir (1936) refers to these lesions as juvenile leprosy and when they were first noticed by us in South India we designated them precutaneous (1937) Subsequently the term incipient lesion of childhood was coined (1941) but none of these terms are entirely suitable although we now are of opinion that the term precutaneous or what would now be called prelepromatous is probably the most suitable name by which to designate the lesions The reasons for this are two fold

(*a*) We believe that these lesions are true precursors of lepromatous leprosy
(*b*) They have many of the features of lepromatous leprosy

The following are their main characteristics

They show themselves usually as small multiple hypopigmented patches with the appearance and distribution of lepromatous rather than neural leprosy That is the lesions are slightly shiny indicating some erythema with the periphery fading imperceptibly into the surrounding normal skin so that there is no marked difference making photography of the lesions without an infra red or a deep red filter extremely difficult There is no loss of tactile thermal or pin prick sensations There is almost invariably a history of contact with an open case In addition there is no nerve enlargement or anaesthesia of the extremities and the lesions are negative to standard methods of examination Their lepromin is also negative Because of their vagueness the lesions are better seen in an oblique light but bright preferably sunlight and like [illegible] are liable to be missed in a dull light

Histologically the incipient lesion cannot be definitely diagnosed because there is no characteristic histological change It consists of round celled infiltration diffusely distributed underneath the epidermis little evidence of focalisation and a few [illegible] phages are usually seen here and there under the epidermis Nerves are [illegible] in the corium and are not invaded

It has been pointed out that this type of leprosy is comparatively uncommon as only some thirty four cases have been described in the Silver Jubilee Children's Clinic over the past five years This represents [illegible] per cent of the children who have been registered at the Silver Jubilee Children's Clinic Saidapet Madras In actual number this seems of little significance but the importance of these lesions cannot be [illegible]

stressed because firstly they are difficult to diagnose and secondly a number of these cases have become lepromatous in the past five years hence the gravity of their prognosis is sufficient reason we feel for emphasising the importance of the incipient lesions of childhood

It cannot be too strongly stated that because of the difficulty of recognising these lesions in children they should not be diagnosed by the inexperienced unless they are multiple and unless there is a definite history *of contact with an open case We have* already emphasised the gravity of diagnosing a case as leprosy especially in children and very great care should be exercised in the matter before the incipient or pre lepromatous lesion is diagnosed

We are of opinion that the counterpart of these lesions is seen occasionally in adults In one of our village surveys some years ago we came across two adults with vague hypopigmented patches *with the distribution of lepromatous rather than neural* leprosy but without any of the cardinal signs Two years later both these adults on resurvey were found to have become lepromatous cases Little is known of the existence of the prelepromatous macules in adults and therefore this is only briefly mentioned in order to draw the attention of workers to the possible existence of such a lesion

**2 Atypical or Border-line Cases**

Since the Cairo Conference (1938) it has been increasingly realised that the classification of neural leprosy into simple macular and tuberculoid macular does not represent the true picture neither for that matter do the two main divisions of the disease— —neural and lepromatous—give a correct and comprehensive indication of the clinical *aspects of leprosy From time to time leprologists have been puzzled by certain* lesions which are neither true leproma nor frank tuberculoid Reference has been made in the chapter on Pathology to a type of tissue reaction which appears to be only partially effective and in which the cellular response of the tissue appears to be thrown into complete confusion Until a clearer picture of this type of reaction can be obtained and we have ascertained the exact place in the classification of leprosy in which such clinical lesions can be placed it is better to refer to the whole group as atypical lesions of leprosy The term intermediate is in some ways a more satisfactory one for both clinically and histologically these lesions represent a half way house between tuberculoid on the one hand and leproma on the other

As has been stated this form of leprosy has puzzled workers but it has been recognised for some time particularly by Wade (1940) who uses the term border line case and Lowe (1937) *who has referred to it as N ? C South American* writers speak of tuberculoid cases with negative lepromin reactions Wade mentions some of the features of this condition particularly the more succulent nature of the lesions and the greater tendency histologically for the granuloma to be separated from the epidermis by a narrow zone which is usual in leproma The clear zone between the epidermis and the granulomatous masses frequently shows numerous dilated capillaries The nerves are usually grossly invaded although sometimes the invasion is less marked than in massive tuberculoid leprosy

Clinically these lesions usually appear to behave in a manner similar to the major tuberculoid ones in that they frequently recover although the recovery period is very much longer There are one or two curious features with regard to their progress

For one thing the patients frequently pass through a stage of extreme emaciation and one sometimes almost despairs of their lives During the stage of activity of the lesions and emaciation the patients frequently become febrile the fever sometimes lasting for months and not responding to the antimony products The lesions are erythematous and percussion of the patches elicits acute tenderness In the most severe cases they may break down rapidly and ulcerate Altogether the patient is very miserable and causes the physician considerable concern Bacilli can usually be demonstrated and they may be found considerably longer than in tuberculoid cases during the reacting phase—that is for more than six months and sometimes as long as eighteen months In other words clinically these cases usually show features akin to both lepromatous and tuberculoid leprosy but apparently they almost invariably recover Clinically these lesions are difficult to describe some are mistaken for tuberculoid leprosy but on closer examination the infiltration is seen to be much softer or more succulent The latter term is hard to describe but the phrase soft infiltration as compared to hard whipcord like edges helps to give an indication of their appearance or a better idea may be conveyed by stating that these lesions look as if they contain water (Ball) Clinically the lesions appear to behave in a manner similar to tuberculoid leprosy in that they show a marked tendency to resolve although the recovery period is much longer Frequently the lesions are much more active as seen by their spreading and less distinct edges and their greater liability to scaling and often gross ulceration During the stage of marked activity they are usually bacteriologically positive and they remain so for nine months or more In the ulcerative stage the patient commonly shows a marked febrile reaction (102 –104 F ) and this may persist as long as six or seven months The fever is of an intermittent type with the maximum rise in the evening

The histology of the lesions varies considerably Some simulate tuberculoid leprosy except that there is a free sub epidermal zone which is very vascular Others simulate leproma except that there are epithelioid cell and an occasional giant cell with the nerves in the subcutaneous tissue invaded Still others are almost identical with the sarcoids that is masses of packed epithelioid cells with occasional giant cells Here again a differentiating feature is the presence of gross nerve invasion While clinically these differences cannot be diagnosed with certainty histologically atypical lesions fall into four categories

(i) Atypical tuberculoid
(ii) Atypical leproma
(iii) Intermediate lesion
(iv) Sarcoidal

Mention is made in the above divisions of the atypical lesion styled intermediate Since the recent work of Wade (1940) Lowe (1940) and Cochrane (1940) it is evident that there is a histological picture which is betwixt and between leproma and tuberculoid and which shows the presence of giant cells and epithelioid cells with marked round celled infiltration in parts of the corium free sub epidermal vascular zone and some foamy cell change It is these lesions with this definite histological picture to which the term intermediate is confined It is extremely difficult to give the reader a true picture The photographs illustrating this chapter may be of some help and the following is an attempt to summarise the main clinical and histological findings

in tuberculoid, lepromatous and atypical leprosy. Photomicrographs of this condition are included in the chapter on Pathology.

| TUBERCULOID | ATYPICAL | LEPROMATOUS |
|---|---|---|
| Raised erythematous and grossly infiltrated lesions with sharply defined edges which remain well demarcated even as they extend. | Raised erythematous lesions with succulent appearance; the edges are infiltrated but less well defined. | Erythematous lesions; infiltration usually slight; if marked, *lesions tend to coalesce*. There is no definite demarcation of edges and difficult to distinguish where lesion ends and normal skin commences, for in such cases there is often no normal skin. |
| During reaction lesion may be tender and desquamate and occasionally ulcerate. Febrile period, if any, of short duration. Patient seldom needs hospitalisation. Nerve abscess common. | During reaction marked burning and tenderness of lesions; liability to ulcerate. Fever sometimes prolonged, leaving the patient emaciated and extremely ill looking. Frequently requires hospitalisation. May show nerve abscesses but rare. | During reaction lesions show exacerbation of signs *with rose spot nodules typical* of lepra reaction. Fever with maximum rise at 4 p.m. *and all signs of acute reaction* (see Chapter XIV). No nerve abscess; enlargement of nerves due to an interstitial fibrosis. |
| *Bacilli.* Lesions in state of *reaction positive*, but bacilli disappear within 3–6 months. | Lesions practically always *positive, and in active cases* may be present for 6–9 months or more. | Lesions always positive *and usually take months or* may be years to become negative. |
| *Histology.* Granuloma extends to epidermis with no sub-epidermal clear zone. *Giant cells and epithelioid* cells well marked; round-celled infiltration concentrated *around hair follicles* and vessels in the corium. Gross invasion of nerves. | Granuloma respects sub-epidermal zone in which there are numerous dilated capillaries. *Infiltration diffuse* with less tendency for concentration of round cells. Histology varies; may show lepra cells and foamy cells; may show packed epithelioid masses or granuloma may consist of undifferentiated macrophages. Nerves invaded frequently, grossly. | *Clear sub-epidermal zone* not markedly vascular. Lepra cells (macrophages). No *epithelioid or giant cell.* Round-cell infiltration not marked but always diffusely distributed. Nerves stand out clearly with slight proliferation of perineurium. Foamy cell may be present. |
| *Lepromin.* Positive. | *Lepromin.* Usually negative; may be moderately positive in stage of activity. | *Lepromin.* Invariably negative. |

We are of opinion that this group of atypical lesions is important, firstly because of their tendency to be confused with leproma, and puzzlement as to the efficacy of treatment arises as a result of their great tendency to spontaneous recovery. Secondly, because they may be confused with tuberculoid lesions and hence give the impression that tuberculoid leprosy may turn into leproma. It is our opinion that tuberculoid and leproma cannot exist together, for it is hardly conceivable that one part of the skin is in active and effective defence and another shows ineffective defence; hence there is little justification for claiming the existence in the same section of tuberculoid

and lepromatous change. We cannot agree with Lowe (1940) that the group is not sufficiently large to interfere seriously with the Cairo Conference classification because we consider these lesions to be more frequent in South India, but unless a definite note is made of them great confusion is liable to arise and workers fail to understand what appear to be anomalous phenomena. Ryrie (1934) has referred to such lesions as ulcerating tuberculoid, and his description bears close resemblance to atypical lesions showing gross emaciation with marked ulceration.

Earlier workers have described a condition known as Lazarine leprosy. It is difficult to place this manifestation in any modern classification, but it is more than probable that many cases of so called Lazarine leprosy may have belonged to one or other of these atypical groups which frequently shows extensive ulceration.[2]

### The Development of Lesions of Leprosy

There has been much speculation as to the development and method of progress of leprosy in the body. Muir (1923) visualised the extension of leprosy from an initial lesion in the skin or nerve, and from this the disease spreads by an ascending infection along the nerve sheath and by the lymphatics and to a lesser extent the blood stream, and thus the disease becomes generalised throughout the body. We have indicated that leprosy develops from a primary focus possibly analogous to the Ghon focus in tuberculosis, and its method of spread is directly influenced by the actual or potential immunological response (tissue immunity) of the skin. When this is marked as in tuberculoid leprosy the infective agent is anchored in the skin and the disease becomes spontaneously arrested. Where it is absent there is a grave possibility of widespread invasion of the whole reticulo endothelial system and serious lepromatous leprosy results. We have suggested that the M. leprae finds its most favourable habitat in the reticulo endothelial system. It endeavours to invade this system while the tissues of the body, whenever possible, try to prevent such an infiltration either as in tuberculoid leprosy by a tissue response giving rise to an effective barrier and preventing the passage of the bacilli from the primary focus to the reticulo endothelial system, or as in pure neural leprosy (neural anaesthetic) by a violent fibrous tissue response giving rise to an interstitial fibrosis. For reasons not altogether understood the M. leprae apparently cannot infiltrate the reticulo endothelial system except via the skin, and if this is prevented no progressive leprosy is possible. This may be the explanation of the failure of animal inoculation.

If this is the case it may be profitable to discuss how far one type of leprosy is possible of developing into another type, and in order to study this there must be some understanding of what are the basic lesions of leprosy. I indicated (1940) that leprosy may develop from three basic lesions—the incipient, simple macule and the tuberculoid. Since writing this article Pardo Castello and Tiant (1944) have described the lesions of leprosy under non specific, tuberculoid and lepromatous, stating that "the lepromatous and the tuberculoid types are definite clinical pathologic bacteriologic and immunologic forms of leprosy and that the non specific type represents transitional stages." These authors further give a diagram which indicates that leprosy of the skin and nerve arises from three distinct lesions and designate them lepromatous, tuberculoid and non specific. Before one can accept such a scheme it is necessary to

[2] It is probable that the great majority of atypical lesions ultimately pass into leproma and therefore the term transitional for these cases may be appropriate.

ask *are such lesions the first lesions to appear?* In other words does leproma commence at all times as leproma and never pass through a transitional stage and does this also apply to tuberculoid leprosy? The older conception that lepromatous lesions usually commence as neural is largely discarded.

Rodriguez and Wade (1939) have made interesting and valuable contributions on the status of neural cases and the development of tuberculoid leprosy and have shown that the simple macule may develop into leproma and that *the tuberculoid case* may set in as a reactive phenomena in a previous simple macular case or in some instances the lesions commence as minor tuberculoid and there may be no previous simple macular phase. Over a period of seven years lesions have been observed in children in Saidapet and Tables XI and XII give to date the development of these lesions and their transformation into other types.

DEVELOPMENT OF LESIONS OF LEPROSY

TABLE XI

| Type | Number Registered | Number Condition not known | Number turned Intermediate | Number turned Leproma |
|---|---|---|---|---|
| N (ns) | 238 | 103 | 1 (0.42%) | 15 (7.52%) |
| Nt (minor) | 236 | — | — | 3 (1.27%) |
| Incipient | 40 | 3 | 3 (7.50%) | 13 (32.50%) |
| Suspicious | 145 | 48 | 1 (0.68%) | — |

The tuberculoid minor cases that have been noted as turned leproma were clinically tuberculoid but histologically were not confirmed.

*CHANGES IN TYPES*

TABLE XII

| Type on Admission | Number Registered | Condition not known | Balance | Changed clinically to | No |
|---|---|---|---|---|---|
| N (ns) | 238 | 103 | 135 | Tuberculoid | 29 |
| | | | | Leproma | 15 |
| | | | | Intermediate | 1 |
| Incipient | 40 | 3 | 37 | Simple macular | 11 |
| | | | | Tuberculoid macular (Nt) | 2 |
| | | | | Lepromatous | 13 |
| | | | | Intermediate | 3 |
| Suspicious | 145 | 48 | 97 | Simple macular | 12 |
| | | | | Tuberculoid macular Minor | 14 |
| | | | | Intermediate | 1 |

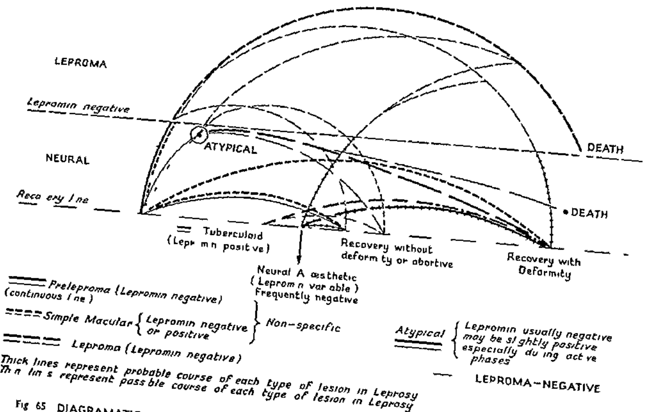



Fig 65 DIAGRAMATIC REPRESENTATION OF THE DEVELOPMENT OF LESIONS OF LEPROSY
(MODIFICATION OF MUIRS LEPROSY CURVES)

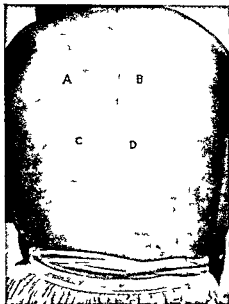



FIG 66 —The prelepromatous macule or incipient lesion of childhood

It has been contended by Lowe and Velasco (1941) that tuberculoid leprosy may progress into lepromatous but except in a small number of cases (1 27 per cent ) in which the tuberculoid process is of a minor degree and not of sufficient intensity to react positively to leproma I have not in my experience ever been convinced that this happens Any tuberculoid cases which have appeared to change have proved on closer study to belong to the atypical group

The evidence of the past ten years in South India indicates that the conception that all lesions of leprosy develop from certain basic lesions appears to be confirmed and Fig 65 is an attempt to illustrate diagrammatically the probable and possible course of development from these basic lesions viz non specific tuberculoid and neural anaesthetic Muir (1926) visualised the course of leprosy as a series of parabolic curves passing from the neural stage through leproma and ending in the secondary neural deformed or burnt out case He depicted in this representation the possibility of a few cases progressing along a low curve and reaching the advanced neural stage without passing through the lepromatous stage Our opinion however is that in the majority of cases the various types of leprosy remain true to type that is neural remains neural and leproma continues as leproma only in the minority of cases do lepromatous lesions disappear and the patient becomes a secondary neural case In a few instances—the number is probably higher in the early lepromas—leproma does reach the recovery line and the disease clears up without deformity The majority of lepromas however after passing through periods of comparative or actual quiescence end in death with lepromatous signs still present Is there then any indication which would help the clinician to estimate the likelihood of a simple macular case becoming leproma ? Rodriguez and Wade (1939) indicated the greater tendency of the simple macular cases which showed multiple lesions to become lepromatous From material in the children s clinic Saidapet Madras and the Lady Willingdon Leprosy Sanatorium Chingleput this observation is confirmed and it has also been pointed out by Cochrane Rajagopalan *et al* (1941) that approximately 48 per cent of all simple macular lesions

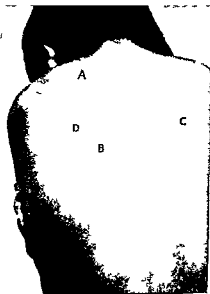



FIG 67 —Note the great vagueness of the lesions their multiplicity and distribution They were negative to standard methods of examination

tested were negative to lepromin It is therefore reasonable to assume that the factors which are of greatest importance in estimating the probability of a case turning leproma are the age of the individual the multiplicity of the lesions and the lepromin reaction We are therefore convinced that the majority of lepromas commence from pre lepromatous macules (incipient lesions in childhood suspicious lesions in adults) some however develop from the simple macular lesions (approximately 7 per cent) There has been no evidence from the work in Madras that leproma ever starts as leproma without a previous macular stage in which it has so far been impossible to demonstrate bacilli by standard methods of examination

It will be noted that the neural anaesthetic type has been included in the term basic lesions We are of opinion and the reason is stated in the chapter on Pathology that leprosy may commence as a neural anaesthetic case and continue as such through out life Rarely however as Roy (1932) pointed out does a neural anaesthetic case in the later stages become lepromatous

It is impossible to place at present the atypical case in its right position and hence this is represented as possibly developing from simple macular leprosy and hence is not included in the basic lesions It is hoped that this modification of Muir s curves in the diagram will give some appreciation of the probable course and development of the various lesions of leprosy

NOTE —Recently (1946) there has been considerable discussion on the classification of leprosy and the following is a modification of the Cairo classification based on the criticism of certain South American workers and as a result of the study of the disease in India amended accordingly This classification correlates the immunologic histologic and clinical picture and gives we believe a clearer representation of the disease

I Non specific lesions (or uncharacteristic lesions)
 (a) Neural macule (simple neural of the Cairo classification)
 (b) Prelepromatous macule (incipient lesion)
 (c) Neural anaesthetic leprosy
II Active tissue immunity (? allergic)
 (a) Tuberculoid leprosy (minor tuberculoid major tuberculoid)
III Absent tissue immunity (? anergic)
 Lepromatous leprosy
IV Partial or varying tissue immunity
 Intermediate or border line cases (atypical tuberculoid atypical leproma and sarcoidal leprosy)

CHAPTER IX

## DIFFERENTIAL DIAGNOSIS

We are now in a position to discuss those diseases and conditions which simulate leprosy In doing so it must be remembered that on the one hand the physician unfamiliar with leprosy *seldom bears in mind the possibility of the patient having* leprosy unless the disease is so obvious that it cannot be missed while on the other hand the physician who has commenced to take an interest in leprosy is very liable to diagnose everything as leprosy A good rule for those to follow who are building up their experience is when in doubt never diagnose leprosy Further if one refuses definitely to diagnose leprosy—at least until sufficient experience is attained —unless one or both of the cardinal signs are present a physician may miss a few early cases but he will save much distress *for the fear of leprosy is liable to haunt persons* in the East in the same way as the fear of cancer is in the West Therefore always be reasonably certain before a diagnosis is made of what to many is a dreadful disease and one that is greatly feared

It may be thought that to miss diagnosing an early lesion of leprosy will result in the withholding of adequate treatment and the condemning of the patient to life long misery through his becoming an advanced lepromatous case It will however be apparent that this is not necessarily the case for the majority of early lesions as has been shown have a great tendency to spontaneous disappearance and as will be mentioned later the special remedies used for leprosy are not specific and therefore there is no cause to be disturbed unduly should an early case be missed and treatment not started It is well then always to bear in mind that the two cardinal signs of leprosy are

1 The presence of anaesthesia
2 *The pre ence of M leprae discovered by standard methods of examination*

We are of opinion that the diagnosis of the doubtful case should be left to the specialist If the above principles were followed by the general physician in the tropics *unnecessary mental suffering* and useless treatment would be avoided

In considering the differential diagnosis of leprosy those conditions which are liable to be confused with neural leprosy will first be described the differential diagnosis of lepromatous leprosy will then be discussed

### NEURAL LEPROSY

#### A Simple Macular

The hypopigmented lesions of simple macular leprosy have to be distinguished from the following conditions

1 *Birth Marks* (naevus anaemicus)

In the darkly pigmented races hypopigmented areas which appear to be congenital and possibly of a similar nature to naevus anaemicus are not uncommon These

lesions have been mistaken for early neural leprosy The hypopigmented areas look as if they are part of the texture of the skin and not a pathological lesion The history will indicate that the condition has been present from birth and there will be no other signs of leprosy An interesting observation is quoted by Sutton (1931) as to the pathology of naevus anaemicus He states that naevi of this type are due to a congenital abnormality of the nervous apparatus of the blood vessels the vasodilators being absent while the vasoconstrictors are present Such an explanation may throw some light on the pathology of the hypopigmented lesion in leprosy for the reason for the loss of pigment in these lesions has never been adequately explained In this instance the vasodilators may be affected through the nerve terminals in the skin being damaged by leprosy



Fig 68 —Birthmark on face Note enlargement of the great au[illegible] Also a case of leprosy

2 *Tinea Versicolor*

The distribution is different from the simple maculas of neural leprosy although when extensive they may be widespread over the body The typical distribution is seen between scapulae front of chest face and neck Molesworth has pointed out that in Europeans tinea versicolor practically never invades the face It should be remembered that in Indians tinea versicolor frequently affects the face The lesions show a fluffy appearance which has been described as the colour of coffee with milk (*café au lait*) The lesions look as if powder or fine dust has been scattered on the surface of the skin The characteristic fungus can be demonstrated by scrapings from the scales of the skin

3 *Scars from Infected Impetiginous Lesions and Boils etc*

Wherever there has been a generalised infection with scabies and impetigo hypopigmentation is liable to result These lesions however are small and are surrounded by a characteristic hyperpigmented border As far as I am aware hyperpigmentation never occurs in leprosy It should be borne in mind that impetigo in the East frequently becomes secondarily infected Not infrequently as a result of a boil a hypopigmented patch quite large in size will develop but if a careful examination is made the scar of the depressed centre indicating where the core of the boil was will be seen Scars of all kinds have been mistaken for leprosy and these are often anaesthetic but the atrophic condition of the skin and the absence of other signs will throw light on the diagnosis A word of warning needs to be issued here sometimes patients will cauterise an area in order to get rid of the signs of leprosy but a careful history will exclude this possibility When in doubt a biopsy may help

4 *Leucoderma*

This when well marked cannot be mistaken for leprosy but before pigment has been completely lost the lesions may show a mottled appearance and this may be

mistaken for hypopigmentation due to leprosy The absence of cardinal signs and the distribution are all against leprosy and if the patient is watched in due course the characteristic complete loss of pigment will be noticed

5 *Small Hypopigmentations around Mouth and Lips*

Frequently children in the tropics especially if they have a running nose develop scaly hypopigmented lesions on the cheek or in the vicinity of the lips Similar lesions also occur in nutritional deficiencies If it is remembered that no diagnosis should be made unless the lesion is typical a mistake will not be made These small scaly nutri-



FIG 69 —Old chronic patch (fungus infection)



FIG 70 —Leucoderma Note the complete vitil ge ith areas of pigmentation in the centre (*Photo by Dr T B M Sloan*)

tional pigmentations are usually associated with angular stomatitis No lesion on the mouth or face should be definitely diagnosed unless absolutely typical

6 *Seborrhoea*

Extensive seborrhoea may give ground for confusion but the distribution behind the ears axillae under the breasts in women and around the umbilicus should help to differentiate this condition especially as it is invariably associated with dandruff in the scalp

7 *Phrynoderma*

This condition was first described by Nicholls (1938) in Ceylon and later by Akroyd in India It is sometimes associated with hypopigmentation The lesion has the appearance of a lichen spinulosum the hairs stand out from the follicles and there is no

anaesthesia Large doses of Vitamin A should be given and this will clear up the condition if present thus establishing the diagnosis

**B Neural Tuberculoid**

In considering the differential diagnosis of these lesions the following conditions must be borne in mind

1 *Tinea*

Tuberculoid leprosy is not infrequently diagnosed as a tinea The fungus can be discovered by examining a scraping from the scales of the skin after soaking it in 30



Fig 71 —Extensive xerotic condition of the skin

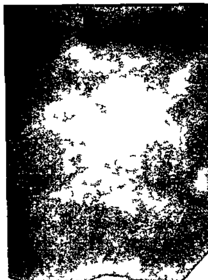


Fig 72 —A lichenoid patch on abdomen (? lichen planus)

per cent KOH for at least twenty minutes or longer if necessary When in doubt the therapeutic test can be applied for if a lesion is fungoid it will disappear with the appropriate treatment If a lesion does not itch and has been present for 6–12 months and does not respond to ordinary medication and a biopsy should be performed it is probably leprotic in nature This maxim is useful to remember in the case of Europeans in the tropics who may come into contact with leprosy

2 *Syphilis*

The pleomorphic characteristics of secondary syphilis frequently give rise to great confusion The Wassermann reaction may not help because in leprosy especially when the lesions contain many bacilli this may be positive The lesions of syphilis are frequently seen on the palms and soles associated with leukoplakia a history of syphilis and finally the therapeutic test will establish the diagnosis for treatment will clear up the syphilitic lesions leaving those of leprosy little affected

3 *Psoriasis*

This condition is frequently a cause of confusion for in many respects psoriasis is not unlike tuberculoid leprosy in the stage of reaction The points of difference which should be kept in mind are

(1) The characteristic distribution of *psoriasis elbows knees scalp* While we are aware that the lesions of psoriasis occur anywhere on the body lesions should always be looked for on these sites

(2) The scaliness of the lesions is very much more marked and shows itself in silver scales On removing the scales one gradually comes down to a base in which there are small bleeding points



Fig 73 —Secondary syphilis

(3) There is no loss of sensation neither is there any enlargement of the superficial nerves

(4) It is not possible to find M leprae in the lesions

(5) Characteristic histological changes of psoriasis and not leprosy

4 *Lupus Vulgaris*

Because the histology of these lesions is similar to that of leprosy skin sections are some times diagnosed as skin tuberculosis or lupus when in reality they are sections from tuber culoid leprosy It is well to bear in mind that while lupus vulgaris is seen in India and the East this is a comparatively rare condition Whenever a section shows tuberculoid histology it is more likely to be leprosy than lupus In lupus vulgaris the infiltration process is usually seen deeper in the corium and there is no evidence of nerve invasion In lupus verrucosus there are gross epidermal changes whereas in leprosy epidermal changes are seldom if ever seen Other varieties of tuberculides such as erythema induratum papulo necrotic tuberculide are extremely uncommon and are not likely to be confused with any form of leprosy

5 *Granuloma Annulare*

This again is a rare condition I have never seen a case in India It is mentioned because some authorities consider the condition closely related to the tuberculides It is most commonly found on the back of the fingers its slow evolution, lack of sensory loss or nerve enlargement should serve to distinguish it from tuberculoid leprosy Biopsy will establish the diagnosis for in granuloma annulare there is a deep seated infiltration in the corium *with necrosis in the centre* In tuberculoid leprosy there is never this characteristic necrosis in the corium of the skin

6 *Sarcoids*

The differential diagnoses of these lesions are mentioned here although the sarcoidal type of histology is most frequently seen in the atypical case The condition is extremely rare and the Besnier Boeck syndrome is associated with lesions in the lung lymph nodes liver and spleen The histology is similar to atypical tuberculoid except that the nerves in the corium are not invaded Pardo Castello and Tiant mention internal lesions in leprosy of the sarcoidal type but this has not been confirmed by other workers The disease appears to be extremely rare in the tropics and is hardly likely to cause confusion Some authorities have considered sarcoids are related in some way to leprosy but it is more likely that in these instances these lesions were confused with the atypical type of leprosy

7 *Lupus Erythematosus*

The characteristic lesion on the nose bat wing distribution with the atrophic condition of the skin should differentiate from leprosy The histological picture is entirely different and giant cells are usually absent

8 *Eczema*

This is only mentioned in passing for in the acute reaction phase of tuberculoid leprosy the cellular reaction may be so severe as to give rise to marked inflammation and oedema of the tissues especially is this the case if one side of the face only is affected In all such cases the great auricular nerve on the affected side will be found to be enlarged the lesions show fine scaling and percussion elicit acute tenderness Other points are absence of serous exudation and no marked itching Usually in the acute stage of reaction M leprae can be found by standard methods of examination

9 *Pellagra*

This may be confused with leprosy but the distribution of the lesions in pellagra —neck arms exposed parts of the body characteristically denuded and inflamed tongue accompanied by diarrhoea and possibly mental disturbances—should make it easy to differentiate from leprosy

**C Differential Diagnosis of Neural Anaesthetic Leprosy**

It is frequently not realised that neural leprosy can manifest itself as a pure neural case with typical glove stocking anaesthesia and when such a case presents itself at a hospital out patient department it is liable to be confused with the following conditions

1 *Peripheral Neuritis*

The most common cause of peripheral neuritis is a dietetic deficiency associated with a deficiency of vitamin B complex Less common causes are diabetes arsenic alcohol If it is remembered that the reflexes are never lost in leprosy and frequently as Subramaniam has pointed out exaggerated the diagnosis of peripheral neuritis should not be difficult In arsenical lesions of hands and particularly of the nails the presence of traces of arsenic in nails or urine will confirm the diagnosis In diabetes the presence of sugar in the urine will help although diabetes and leprosy can occur

together Sometimes the diagnosis can be established by cutting down on the peroneal or ulnar nerve and taking a scraping from the nerve itself after opening the sheath as the M lepra can occasionally be found in the nerve sheath when it is impossible to demonstrate it elsewhere. Anaesthesia associated with nerve enlargement is always due to leprosy

2 *Bernhardt s Syndrome*

Muir drew attention to the confusion which may arise from mistaking a neuritis of the lateral femoral cutaneous nerve for leprosy This condition shows itself as an area of anaesthesia on the outside of the lower two thirds of thigh and is associated with subjective symptoms of numbness or formication The etiology of the condition is obscure some say that it is due to a fibrositis of the muscles and the nerve symptoms are secondarily due to the constriction of the nerve fibres in fibrous tissue and thus giving rise to anaesthesia This condition may be similar to that described by Sutton (1931) who attributes the first description to T C White and names it meralgia paresthetica and attributes the cause to a defective arch which results in changes in the foot or in the comparative position of the long bones Any cases which I have seen have occurred in adults with definite foci of sepsis in the teeth The limited distribution of the anaesthesia the history and age of the individual should serve to avoid confusion

3 *Syringomyelia*

This is a rare disease and should not be diagnosed without unequivocal evidence Dissociated anaesthesia is present i e loss of thermal and pain sensation this takes place before tactile impairment The upper limbs are usually affected and the lower seldom muscle atrophy is seen before sensory loss and deformity and scars from burns are common signs There is no enlargement or tenderness of superficial nerves

4 *Cervical Rib*

This affects the upper part of the extremity usually on one side only The patient complains of heaviness of limb the stimulation of sympathetic on affected side is some times noted and the subclavian artery may be more prominent X ray will reveal the condition

5 *Raynaud s Disease*

This is a very painful complaint with signs of vasomotor disturbances The disease starts at the tip of the fingers with anaesthesia of the affected part only There is no enlargement or tenderness of nerves The pain of the lesions should differentiate it from leprosy

6 *Trophic Ulceration*

Ulceration due to syphilis and diabetes should be kept in mind but these do not usually show marked bone involvement and are liable not to be so extensive as in leprosy In diabetes sugar will be found in the urine in syphilis there is strongly positive Wassermann but it must be borne in mind that both conditions may complicate leprosy The knee jerks however are not absent in leprosy as they are in neuro syphilis and there will be other signs of tabes dorsalis

7 *Facial Paralysis*

It must be remembered that Bell s paralysis is not uncommon in India as well as such conditions as syphilitic invasion of the facial nerve and facial paralysis may also be the result of a cerebral lesion Facial paralysis without other signs of leprosy must be very rare and a diagnosis of leprosy on this sign alone should not be made

*Other Conditions*

The following conditions may be mentioned but are too rare or present so little difficulty that description is not necessary (*a*) Scars following burns (*b*) Yaws Scarring due to yaws may occasionally cause confusion (*c*) Dejerine de Sotto s syndrome This is a condition which shows enlargement of nerves associated with talipes and other congenital deformities and is very uncommon

*Injury and Tumour of Nerves*

It must be remembered that an injury will not only give rise to permanent damage to a nerve but may be the exciting cause of a peripheral neuritis In cases where there is a definite history of injury unless the diagnosis is unequivocal great hesitancy should be shown before a diagnosis of leprosy is made The surest method of differentiating a tumour of the nerve from leprosy is by operating and seeing the condition of the nerve In nerve abscess the whole nerve will be thickened with more marked swelling at the place of the abscess Neuro fibromata are seen in isolated nodules in the nerve without corresponding enlargement of the whole nerve

**D Differential Diagnosis of Lepromatous Leprosy**

If it is borne in mind that in all cases of active lepromatous leprosy M leprae can be demonstrated by ordinary standard methods of examination mistakes will seldom be made by the physician who exercises care The following conditions have to be remembered

1 *Dermal Leishmaniasis*

This condition simulates lepromatous leprosy so closely that unless careful bacteriological examinations are done the patient s condition will be wrongly diagnosed Suspicion is aroused as the distribution of lesions are not typical There are small hypopigmented lesions most marked in the axillary region and back of the neck associated with the infiltrated erythematous lesions also nodules closely resembling those of leprosy Usually there is a history of kala azar which has been insufficiently treated Leishman Donovan bodies are difficult to find but if not discovered in the skin may be demonstrated in a smear from a sternal puncture The consistent absence of M leprae however should put the physician on his guard

2 *Syphilis*

As has been mentioned the Wassermann reaction is frequently positive in lepromatous leprosy and cannot be relied on Absence of bacilli distribution and history help to confirm the diagnosis

Nodular leprosy if bacteriological examinations are properly carried out shou



Fig 74 —Dermal leishmaniasis showing typical hypopigmented lesions



Fig 75 —Dermal leishmaniasis showing hypopigmented lesions infiltrated lesions and nodules.



Fig 76 —Nodules of dermal leishmaniasis



Fig 77 —Lesions of the face simulating leprosy (dermal leishmaniasis)

be easy of detection The following conditions have at various times been confused with the disease adenoma sebaceum leukaemia acne erythema nodosum A word might be added on the last two conditions the pitted infiltrated and somewhat oedematous face may make one suspicious but the presence of comedones and the absence of M leprae establishes the diagnosis The only reason why erythema nodosum is mentioned is that this condition can very closely simulate the rose spot nodule of leprae reaction The absence of bacilli however would raise suspicion that the diagnosis is wrong It should be remembered that in the fair Indian and European lesions of leprosy sometimes have a purplish hue any such lesions which have been present for more than six months should excite suspicion and smears should be taken Careful examination will result in the establishment of a diagnosis

3 *Lichen Planus*

This is only mentioned in passing for occasionally the infiltrations of lepromatous leprosy show themselves as small flat topped papules The distribution of the lesions their intensive itching and in the fair person the characteristic bluish or lilac tint of the lesions are points worthy of notice Bacteriological examination will settle the diagnosis

CHAPTER X

# REACTION IN LEPROSY

Much has been written about reaction in leprosy but for this condition to be properly understood it is necessary to discuss the subject under two heads

1 *Signs of activity*
2 Signs of reaction
   (*a*) In neural cases
   (*b*) In lepromatous cases (lepra reaction)

These conditions are separately discussed for it is to be remembered that leprosy *in many instances is an actively progressive disease* and until the disease becomes quiescent either spontaneously or as a result of treatment the patient has to be considered as an active case During the period in which he is active however there is a great tendency greater in some types than in others for acute exacerbations of the condition to arise from time to time and it is these more acute phases that come under the term of reaction If this then be the case it is of utmost importance to be able to judge whether a case is active quiescent or arrested quite apart from the fact whether the activity of the case is such that it must be concluded that the patient *is in a reactive condition The following therefore are the signs that the disease is* still active

1 Increase or decrease of lesions or anaesthesia
2 Erythema and infiltration
3 Tenderness of nerves
4 Presence of bacilli

One or more of the above signs may be present without the patient actually being in a state of reaction For instance the hypopigmentation of a simple macular lesion may extend or the anaesthesia of a limb may increase so long as there are changes in the colour erythema or the extent of the anaesthesia the disease is active On the one hand the lesions or anaesthesia may show gradual extension and the disease progress whereas on the other signs may diminish and the disease gradually retrogresses No lesion can be considered quiescent so long as there is any erythema or residual infiltration I am well aware as has already been indicated that many neural lesions especially *of the minor tuberculoid type spontaneously retrogress but until all in* filtration disappears and only a scar remains the lesions must be considered progressive Whether *active measures in the way of treatment or precautions against infecting* others have to be taken is entirely another matter and these questions are discussed elsewhere All that is emphasised here is that so long as the above signs are present leprosy whatever the type must be considered to be active either actively progressing or actively retrogressing It must be noted that enlargement of the nerves is not mentioned as a sign of activity but only tenderness While generally speaking a large nerve is also tender much of the enlargement may be due to an interstitial fibrosis and the nerve tissue be mainly replaced by fibrous tissue and therefore mere enlarge *ment of a* nerve is not necessarily a sign of activity of the disease To summarise

therefore it might be well to give the definition of "active" cases as laid down at the Manila Conference (1931) held under the auspices of the Leonard Wood Memorial Fund (now American Leprosy Foundation). This conference defined active cases as follows: "Active cases are those in which there are clinical or microscopic evidences of progressive or recessive changes in lesions with or without accompanying systemic disturbances. These evidences include the following: positive bacteriological findings in skin or mucous membrane determined by the usual method, the presence of raised erythematous lesions, increase or diminution of lesions in size or number, tenderness of nerves with or without thickening."

In connection with the consideration of active cases the question arises as to when a case ceases to be active. A case may be active but non infective and therefore it is apparent that the following states need defining:

(a) A non infective case
(b) A quiescent case
(c) An arrested case

**Non infective Case**

Non infective cases are those which have been negative to standard methods of examination for three months and have shown no signs of activity for a similar period, examinations being made each month during this period. The examination should include a clinical examination and a microscopic one from the nasal mucosa and from lesions of the skin from at least eight sites.

**Quiescent Case**

Quiescent cases are those which have been negative to standard methods of examination for six months and have shown no signs of activity for a similar period. Examinations should be made each month during this period and should include a clinical examination and a microscopic one from the nasal mucosa and from lesions of the skin from at least eight sites.

**Arrested Case**

Arrested cases are those which have remained quiescent for two years. Examinations should be repeated every three months if possible and not less frequently than every six months.

It is unwise to encourage lepromatous cases to cease treatment until they have qualified for a quiescent certificate.

I am aware that in defining these terms the Manila Conference recommendations are not rigidly followed in the definition of a quiescent case; the reason for this is because it is thought that the standards laid down at the Manila Conference are not sufficiently stringent.

We are now in the position of being able to discuss the general subject of reaction in leprosy. Reaction in leprosy either shows itself as an acute response on the part of the tissue to the invasion and/or multiplication of the bacilli or else as the result of the breaking down of leprotic foci; the former condition is seen almost solely in neural cases, whereas the latter is only seen in lepromatous cases. It is extremely important to differentiate between these conditions, for in the failure to recognise these two types

of reaction lies the chief reason why there seems to be so much confusion in regard to this subject

**Reaction in Neural Cases**

There are no signs of acute reaction in the simple macular or neural anaesthetic type of neural leprosy probably because the bacilli are relatively scanty and therefore no marked tissue response is seen These cases are judged on the question as to whether they are active quiescent or arrested and according to the definition just given

It is true however to say that simple macular cases may pass into a state of reaction or bacilli may appear in the lesions when this happens the case no longer remains a simple macular one but has probably passed on the one hand from the simple macular stage to the tuberculoid or more rarely intermediate and on the other hand has become leproma Therefore the description of reaction in neural cases is solely confined to tuberculoid macular cases or to the atypical intermediate or border line type the latter can be considered to be neural for nerve involvement is a prominent sign

Reaction in tuberculoid cases is a manifestation of an acute tissue response and therefore all cases which show a positive lepromin (potential tissue immunity) are liable to react violently at any attempt on the part of the bacilli to multiply and endeavour to extend from the skin and nerves to the systemic system for as has already been explained it is via the skin or nerves that the bacilli reach the reticulo endothelial system and the case becomes an active leproma This transformation is not possible in tuberculoid leprosy because of the marked and frequently sudden tissue response anchoring the infective process in the skin and preventing the bacilli from parasitising the reticulo endothelial system What presses the trigger so to speak and ushers in this acute reaction condition it is impossible to say, possibly for some reason e g injudicious treatment indigenous remedies or the nature of the disease the bacilli start multiplying rapidly but unlike true lepra reaction there is an immediate response on the part of the cells and all the signs of active defence are seen The main signs are as follows

1 Exacerbation of lesions which become erythematous with thickened raised and well marked edges In the more acute forms the lesions will become scaly and may actually ulcerate

2 Associated with this the lesions may become oedematous or the oedema may show itself apart from any lesions although other lesions will be affected as well the oedema may simulate angioneurotic oedema in the lips or the loose tissue under the eyelid may become swollen overnight

3 The lesions are hypersensitive and in the more acute stages the patches may be exceptionally tender percussion on the patch elicitating agonising pain due to extreme sensitiveness of all nerve endings to the affected skin This results in an intense burning and pricking The lesions are sometimes so acutely tender that even the gentlest stroking causes acute pain

4 Under such circumstances it is to be expected that the cutaneous nerves are in the same condition and will be found to be thickened swollen and acutely tender

5 Associated with this condition one frequently finds the extremities especially the feet and hands swollen and oedematous pitting on pressure

6 The same conditions may affect the nasal mucosa and distress is caused by swelling and blockage of the nasal passages





Fig 78 Fig 79

M jo tuberculoid lep osy I owing moderate tis ue t on

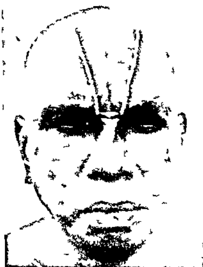




Fig 80 Fig 81

Same case five m nths l ter Les ons completely subs ded No treatment of any kind gi n

In the reaction of true major tuberculoid leprosy the breaking down of the lesions usually falls short of extensive ulceration In the border line case this tissue reaction frequently goes on to gross ulceration and as a result the patient may run a continuous fever become markedly emaciated and if not cared for may die While the reaction condition lasts much longer in the border line case recovery is frequently just as dramatic although the scarring effect of the reaction is more pronounced In a few cases the result of the reaction is seen in the breaking down of the tissue response and the patient gradually passes into the lepromatous type In tuberculoid leprosy the reaction may be very violent but seldom lasts more than three months whereas in the border line case the condition may persist for six or seven months Again in tuberculoid cases apart from nerve damage through intense tissue reaction in the nerves going on to abscess formation and possibly later to fibrosis reaction is always beneficial and the more acute the tissue response the better the prognosis and the more rapid the subsidence of the reaction In the atypical cases however acute reaction while it may dramatically subside has to be viewed in a much more guarded way for actual tissue immunity as seen in the lepromin reaction may be absent or slight and therefore there is always the risk that the reaction may result in the case afterwards becoming lepromatous through the breaking down of this partial tissue immunity [1]

***Reaction in Lepromatous Cases***

True lepra reaction only occurs in the lepromatous case and is an entirely different phenomenon It can best be defined as a state of the body which is produced by the breaking down of leprotic foci Some authorities explain the fever on a toxic basis others suggest that it is an allergic phenomenon If one were to accept the former theory that lepra reaction is a toxic process one would have to assume that toxins are liberated suddenly for in the non reacting phase where bacilli may be just as numerous there is no fever The toxic theory seems only acceptable on the hypothesis that the sudden multiplication of the M lepra and the breaking down of the bacilli results in excessive liberation of protein and other bacterial metabolites and thus produces a fever similar to protein shock We cannot recommend this theory for we cannot visualise an allergic process without signs of allergy In lepra reaction the lepromin test—the only known test of tissue immunity —is invariably negative Further there is no evidence histologically that there is any tissue immunity In Chapter IV it has been suggested that lepra reaction results from the intensive mobili a tion of macrophages in their attempt to dispose of the bacilli which have suddenly multiplied This results in an excessive stimulation of the reticulo endothelial system upsetting the fine equilibrium between the parasite (i e the M leprae) and its host and setting up a febrile condition which continues so long as this equilibrium is disturbed This explanation brings the reaction into the realm of defence Lepra reaction appears to be a defen ive process but one which is unsucce sful and always leads to a further dissemination of the organism and therefore harmful to the patient Lepra reaction is seen in lepromatous cases both treated and untreated If leprosy advances sooner or later bouts of fever are experienced and the patient passes through periodic attacks of lepra reaction Under careful treatment the incidence of acute lepra reaction can be reduced considerably Certain individuals especially in the early stages if carefully

[1] Fu ther experience leads us to bel eve that the vast majority of these cases pass into leproma The change from intermediate to leproma is frequently seen on their first relapse



FIG 8 —Atyp l l ns hist l g lly typ c l tuberculoı l



FIG 83 —S ven month l t



FIG 84 —Atyp al le o cl ally nd l t l gıcally Note ed ma of t su lue to ex s ve t ue re ctı n ( ımmun ty)



FIG 85 —F ur months later

treated never have reactions but other more advanced cases pass from one reaction to another until death intervenes from some intercurrent disease or from the cachexia resulting from prolonged fever

Lepra reaction can be divided into acute subacute or chronic and the following are the main signs and symptoms of the condition

1 Fever
2 Rose spot nodules or evanescent erythematous rashes
3 Increase of lesions and exacerbation of existing lesions
4 Subcutaneous nodules
5 Nerve pain and tenderness (associated with joint and bone pain)
6 Iritis orchitis and lymphadenitis
7 Breaking down and ulceration of nodules
8 Swelling and oedema of feet and hands
9 Acute laryngeal symptoms
10 Multiplication of the bacilli as shown by deterioration of smears (This is sometimes rapid )
11 Sedimentation index test raised

Emphasis must first be laid on acute lepra reaction which may be ushered in by a feeling of malaise and even if patients do not at first feel unwell when the temperature is established they usually complain of discomfort headache and body pain The temperature is characteristic there is always an evening rise and the maximum is usually seen between 3 p m and 5 p m but the highest peak may be reached by 4 p m In the morning the temperature is frequently subnormal The onset of the fever in the evening is not infrequently accompanied by a slight rigor This may be marked if the temperature rises above 102 F The following are the more important signs (apart from fever) which are associated with this condition

1 Exacerbation of existing lesions or eruption of fresh lesions
2 Rose spot nodules and/or evanescent erythematous rashes
3 Subcutaneous nodules
4 Iritis neuritis and occasionally orchitis

We feel that the diagnosis of acute lepra reaction is not justified unless there is fever and one or more of the above signs present In fact the cardinal signs of this syndrome are

(*a*) Fever of characteristic type
(*b*) Exacerbation of existing lesions or eruption of fresh lesions
(*c*) Rose spot nodules or in fair persons evanescent rashes of an erythematous nature

**Fever of Characteristic Type**

The fever of acute lepra reaction is characteristic If a patient who is going to develop reaction is watched indications of the onset of fever can be seen in the temperature chart for there frequently develops what might be called a pyrexia below the normal line Everyone shows regular variations of temperature between the early morning temperature on rising and the evening This variation is steady but in a patient before the onset of reaction a greater degree of swing is noted below the normal line and on the onset of the reaction the temperature rises above 98 4 F A characteristic of the fever is that it is a hectic type of temperature subnormal in the morning



Fig 86



Fig 87

Major tuberculo d leprosy—acute i l erative st g Th type of re ction is u nu ual in typical tub rc lo d (photograph taken 3rd No emb er 194 )



Fig 88



Fig 89

Le on ul i led ft se nteen d ys Ulce ation protected by oil—pat nt kept in be l und a cr dle Unless given aref l n irsing care m ght succumb from a secon lary i fect o i (photogr ph taken 0th N vember 194 )

and high in the evening where it is possible to take regular twice daily temperatures it is wise to ask the patient always to take his evening temperature between 3 and 5 p m The matter will be further discussed under the control of treatment Another point of some importance is that any departure from the usual swinging temperature of lepra reaction should be noted for a continuous fever or a remittent fever instead of an intermittent one may be the first indication that some complication has set in While when the level of the fever reaches the higher peaks of 102 –104 the patient may feel ill it i remarkable how frequently he is hardly conscious of fever and is apt to remark on inquiry that he feels quite well

**Exacerbation of Existing Lesions or Eruption of Fresh Lesions**

In any patient with lepromatous leprosy the first sign of reaction may be slightly increased erythema of the lesions This is *particularly noticeable in the fair skin* With this increase in the activity of the lesions themselves the eruption of fresh lesions is frequently noted and quite apart from the rose spot nodules which are about to be described *any deterioration of the patient s condition* either clinically or bacterio logically should be a warning sign to the physician who should keep the patient under careful observation It should be remembered that if reactions are to be prevented *all slight variations in the temperature* general and clinical conditions of the patient should be carefully noted One word might be said with regard to the sedimentation index test While it is true that a rise in the sedimentation index may be an indication of the onset of reaction the physician should not rely on this test overmuch but if he employs it he should correlate it with the temperature clinical conditions and bacterio logical findings in order to obtain a complete picture so that he can the more accurately estimate whether the patient is passing into lepra reaction Reliance solely on the sedimentation index test is liable to lead the clinician astray I have seen a patient in whom other signs indicated the imminent onset of reaction with a sedimentation index of eight pass into acute lepra reaction and within twenty four hours the whole body was covered with so many rose spots that they were separated from each other by less than half an inch

**Rose-spot Nodules or in Fair Persons Evanescent Rashes of an Erythematous Nature**

The rose spot nodule is typical and varies from the size of a pea to lesions which may simulate erythema nodosum The rose spots are painful on pressure and are usually found on the extensor aspect of the limbs back and face The occurrence of the lesions on the face and back serve to differentiate the condition from erythema nodosum We have seen a case in which the whole body was covered with rose spot nodules Each individual lesion seldom persists for more than twenty four hours but they may appear in successive crops while acute lepra reaction lasts Along with the rose spots or apart from them in the fair person vague erythematous rashes may be seen they come and go and may cause great confusion if not recognised Some writers have referred to these as prodromata of leprosy but I believe that all so called prodromal lesions are indications of reaction in which the early signs of lepromatous leprosy have been overlooked

Occasionally accompanying the signs of reaction oedema of the hands or feet is seen This oedema resolves on the subsidence of the reaction

A warning which we feel is essential is that fever and leprosy do not necessarily

mean lepra reaction It is sometimes advisable to withhold any special treatment for reaction for three or four days so as to enable a thorough physical and if necessary laboratory examination to be completed before a definite diagnosis of lepra reaction is made Such conditions as pleurisy pneumonia tuberculosis typhoid kala azar are all liable to be overlooked if the physician s first thought is lepra reaction when a patient with leprosy suddenly becomes febrile

**Subacute Reaction**

Acute lepra reaction usually responds to treatment but if a patient has many attacks of acute reaction he is liable to pass into the subacute or chronic reaction In subacute reaction there is a progressive increase of the disease with periodic bouts of fever which may last for a few days or a week or more followed by a period of low fever and accompanied by signs of reaction The following signs are more prominent in the subacute phase

(*a*) Continuous appearance of fresh lesions
(*b*) Subcutaneous nodules are much more marked and tend to persist
(*c*) Rose spot nodules continue to come and go although the subcutaneous nodule is more characteristic of subacute reaction
(*d*) Iritis lymphadenitis orchitis
(*e*) Neuritis is sometimes a prominent symptom and may give rise to much distress
(*f*) Swelling of the hands or feet or both may be seen and results in permanent damage to the tissues due to the trauma induced from venous and lymph stasis

**Chronic Reaction**

This condition is usually seen in the advanced lepromatous case The patient has considerable discomfort and usually runs a low fever which from time to time and for short periods may be high Subcutaneous nodules bone pain and joint pain are often marked and frequently bone pain is very severe suggesting a chronic osteomyelitis In chronic reaction subcutaneous nodules sometimes as large as a pigeon s egg tend to become fixed to the skin and break down and ulcerate This ulceration may be very extensive and cause acute distress Again if the hands are affected permanent damage due to venous stasis may result ending in an unsightly enlarged and deformed hand or foot In addition lesions of the nose and throat and mouth may show signs of activity and give rise to a painful condition of the mouth and throat In the throat signs of obstruction of the trachea may be present and if oedema of the glottis sets in may necessitate a tracheotomy Besides this severe iritis may occur and the eye condition shows rapid and marked deterioration along with these distressing symptoms there is frequently severe nerve and bone pain The lymph nodes when enlarged tend to break down and end in extensive ulceration frequently the enlargement and suppuration is due to a concomitant tuberculosis infection for sections often reveal histological evidence of tuberculosis The patient becomes very miserable and the condition may last for months leaving him emaciated and unable to resist intercurrent infections—e g tuberculosis bowel or kidney disease—which may be the direct cause of death In all the long history of leprosy there is no more pathetic figure than the patient with chronic lepra reaction He cries out for death and death does not come

Some authorities consider that lepra reaction is beneficial but this is never the case. A short sharp reaction readily controlled may do little harm but more frequently the patient s condition deteriorates and after each reaction it is more difficult to bring the body into a state of equilibrium



FIG 90 — Enlarged deformed hand amputated because deformity and oedema rendered it heavy usele s and unsightly (Incisions in fingers represent places where tissue was taken for biopsy after amputation )

It will now be realised how important it is to differentiate between lepra reaction and reaction in the tuberculoid case The former is ineffective defence in its worse phase the latter is active effective defence the former is invariably harmful the latter apart from the nerve damage which may result is favourable In reaction in tuberculoid leprosy generally speaking the more acute and alarming the signs the more rapid is the recovery which sometimes is so remarkable that the patient s friends may attribute miraculous powers to any remedy which may by chance have been u ed at the time of reaction Generally speaking this description also applies to reaction in the atypical case the difference being that whereas reaction in the tuberculoid case is measured in days or weeks in the atypical or border line case it continues for months frequently six or more

If these two separate and distinct phenomena are not carefully differentiated great confusion and not a little dismay may result For instance if the physician mistakes acute lepra reaction for reaction in the tuberculoid case or in the intermediate case a relatively good prognosis may be given to the dismay and disappointment of the patient with subsequent loss of confidence in the physician

CHAPTER XI

# LESIONS OF THE NOSE, EAR, MOUTH AND THROAT. LESIONS OF THE EYE

## 1 Lesions of the Nose

The importance of nasal lesions in leprosy has been stressed by many writers of this and last century. The opinion, however, that the nasal mucous membrane is the first site of infection we believe cannot be accepted. It is our belief that an initial lesion in the nose does not exist and therefore examination of the nasal secretions for M. leprae as a diagnostic test for leprosy is not only unreliable but futile in early cases. I personally have never seen a primary nasal lesion. Cases have been sent to me as such, but either the M. leprae were found elsewhere or the bacilli found in the nose were not M. leprae but one of the many acid fast saprophytes which abound in that region. If the nasal mucosa is found to be positive without the discovery of M. leprae somewhere in the skin, then it is wise to repeat the examination of the patient carefully and to re-examine the nose and be certain that the bacilli found are alcohol- as well as acid-fast, and to be quite sure that no skin lesions have been missed. The only condition in which the nasal mucous membrane will be found positive without corresponding skin lesions is in the exceptional case which has lost signs of the skin infection and the nasal lesion is a residual one. While a nasal examination for M. leprae is useless in the confirmation of a diagnosis or making a diagnosis in leprosy, the examination of the nose and the subsequent treatment of nasal lesions is of utmost importance. Apart from the added feeling of well being clean nasal passages give to a patient, a person with positive nasal secretions is relatively more infective than one in whom the bacilli is only found in the deeper parts of the corium of the skin.

In examining the nose the technique is important. Swabbing the nose with cotton wool is a most unreliable method. It has been shown by Prabhu that by means of a swab of the nasal mucous membrane a nose may be completely negative, but when a small piece of mucous membrane is removed examination may reveal that it can be as much as five plus positive. Hence the great importance of taking a careful scraping from the nose. A sharp instrument is not recommended. A small scoop such as described in the chapter on the technique of examination or a small Volkmann's spoon should be used. The nose should be seen in a good light, preferably with a nasal speculum, and the internal septum on both sides gently scraped. Each side is scraped separately and smears of each made on a slide. In addition any suspicious area of inflammation or ulceration in the posterior part of the nose should be similarly scraped. If such nasal smears are decolourised with alcohol as well as acid the error of mistaking an acid fast saprophyte for M. leprae will largely be avoided.

Nasal lesions in leprosy can be divided into those seen in neural leprosy and those in lepromatous leprosy.

### (a) *Nasal Lesions in Neural Leprosy*

These only occur in the tuberculoid case, especially in the phase of reaction. It has been pointed out previously that where there are signs of tissue immunity any

part of the body in which the bacilli are active and multiply will show the same essential response The nasal mucosa is no exception In tuberculoid leprosy associated with lesions of the face the nasal mucous membrane particularly over the turbinate bones becomes oedematous and inflamed causing in some cases acute distress These signs disappear on the subsidence of the reaction phase as a rule there is no marked ulceration although on account of the blockage and the holding up of secretions with the irritation involved superficial ulceration may be seen This *however does not give* rise to permanent damage for as soon as the cause of the blockage is removed on the subsidence of the reaction the nasal passages become free the ulceration heals and the mucous membrane returns to normal In the acute phase recovery is speedy and *dramatic in the more chronic type of reaction* when a state of activity persists perhaps for several weeks or more the mucous membrane tends if vigorous treatment is not applied to continue in a state of turgescence with consequent discomfort to the patient So long as the tuberculoid condition is active just so long will M leprae be found in smears taken from the nose

In lesions of the intermediate border line or atypical variety the nose is frequently positive due to the process extending to the nasal mucosa The condition is similar to that seen in tuberculoid leprosy bearing in mind that the duration is more prolonged and therefore positive nasal smears are liable to persist for a longer period than in tuberculoid leprosy In both the tuberculoid and atypical forms the inflammatory process may extend to the lachrymal apparatus and the lachrymal gland become involved

(b) *Lepromatous Leprosy*

At any stage in lepromatous leprosy M leprae may appear in the nose As already stated it is our belief that the nasal mucosa is never the seat of the initial or primary lesion The spread to the nose is probably via the lymphatics or more rarely and in the reaction phase through the blood stream It is to be expected that as leproma advances so the incidence of nasal lesions increase From an analysis of over six hundred cases at the Lady Willingdon Leprosy Sanatorium Roy gives the following percentage with discoverable M leprae in nasal smears

| Type | Positive Nasal Finding | Negative to M leprae |
|---|---|---|
| L1 | 36 59% | 63 41% |
| L2 | 85 88% | 14 12% |
| L3 | 100 00% | nil |

The early changes in the nose have never been thoroughly investigated but to start with there *seems to be little pathological* change The mucous membrane is slightly inflamed secretions more active and the patient may appear to have a cold although M leprae may be discovered in nasal smears with little or no clinical involvement usually however the mucous membrane shows its state of activity by bleeding easily At other times in addition to the inflammatory *condition of the mucous* membrane small greyish white or yellowish spots appear on the mucous membrane of the internal septum As the process extends small punctate ulcers tend to develop These are seen particularly on the septum and may result in a sharp epistaxis if they erode into a small vessel

In all these conditions during the active stage lepromatous ulceration with granulomatous tissue is seen On healing much scarring results and this leads in a



Fig 91.—Atypical bord line or intermediate l on. Not oed m to is cond t n of f\ e and nose. H tologi ally how d l rge foamy giant cells an l fo my ell with fre ub p d rmal va c d on (see Fig 6)



Fig 9 —E ght months lat r nd t n complet ly l ed N t b ws a e not lost



Fig 93.—S ul nt type of l si n of the intermed ite r borde line se H st l gy s ggest atypic l l proma



Fig 94.—Seven m nths l ter. Two ye rs l t r th boy rel psed an l le ons bec me more l ke l proma. No furtl er b op y poss l l

number of cases to atresia of either one or both nasal passages It can be readily realised that in such a chronic inflammatory process almost any pathological condition may be seen and deformity of the nose is frequently marked In passing it should be noticed that the depressed nose in leprosy differs from that in syphilis in that in the former it is the nasal cartilages that become eroded whereas in syphilis the nasal bones are affected While the small bones in the nasal cavity become secondarily affected through spread of the infective process resulting in necrosis the nasal bones never become involved in the same way as syphilis therefore the characteristic deformity of syphilis is absent

The following table gives an analysis by Roy of over 600 cases and indicates the percentage of the varying types of lesions seen in the nose in lepromatous leprosy

TABLE XIII

| Type | Mucous membrane inflamed | Yellow spot | Ulceration (turbinate) | Ulceration (septum) | Haemorrhagic spots | Crusts and ulceration | Perforation (nose) | Atresia (nasal passage) | Occlusion (nasal passage) | Extensive posterior ulceration | Depressed bridge (nose) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| L1 | 10 7 | 8 6 | 6 1 | 11 29 | 18 30 | 5 8 | — | 3 66 | — | 1 22 | 1 53 |
| L2 | 11 15 | 7 52 | 1 91 | 22 3 | 4 96 | 31 17 | 2 67 | 7 [illegible]2 | 1 91 | 6 11 | 22 14 |
| *L3* | — | — | — | *40 0* | — | *60 0* | *8 0* | *32 0* | *28 0* | *28 0* | *40 0* |

In the lepromatous case with extensive nasal involvement the oedema of the mucous membrane with encrustation and the consequent blockage results in a foul smelling discharge from the nose giving rise to the heavy and musty odour so often associated with advanced lepromatous leprosy Much relief from these distressing symptoms can be achieved by systematic and careful treatment

**2 Lesions of the Ear**

It is interesting to note that although the nose is so extensively involved and in spite of the close connection of the nose through the Eustachian tube with the internal and middle ear there has never been described nor have we ever seen lesions of the internal auditory apparatus Lesions of the ear are entirely confined to the pinna Ear lobes are affected in tuberculoid leprosy and in the atypical forms and in lepromatous leprosy In tuberculoid leprosy and in the atypical forms the lesions are usually unilateral or much more pronounced on one side than on the other and associated with lesions of the ear lobes will be found enlargement sometimes gross of the auricular nerve on the affected side In the atypical forms the lesions very closely simulate leproma and unless the patient is examined thoroughly the clinician is liable to err in diagnosing the type of the disease for while frequently lesions on the body will show atypical features the atypical characteristics are not so marked on the ears

Lesions of the ear in lepromatous leprosy may vary from hardly noticeable infiltration or erythema to gross thickening or nodules on the ear lobes The earliest site for



Fig 9



Fig 96

Tuberculoid leprosy affecting the left ear—note swollen appearance—whereas the right ear is unaffected



Fig 9 —Early infiltration of ear lobe



Fig 98 —Ear lobe slightly more involved

nodules to appear in lepromatous leprosy are the ear lobes and frequently on the posterior aspect. Hence the importance of seeing that the patient stands with his back facing the examiner. It is worth while to remember that ear lobes may be the first site which shows the presence of M. leprae and therefore *no examination can be considered complete without having taken careful smears from both ear lobes.*



FIG. 99.—Moderate leproma with infiltrated ear lobes.



FIG. 100.—Note nodules on the posterior aspect of pinna.

### 3. Lesions of the Mouth and Throat

It is to be expected that when the M. leprae invade so extensively the skin of the face and especially when the nose is grossly involved that the mouth and the nasopharynx do not escape. In all probability lesions of the mouth, nasopharynx and trachea arise by direct spread. Although extension via the blood stream cannot be excluded, it is interesting to note that clinical lesions of leprosy have not been described beyond the trachea. Muir has published three cases of leprosy of the lung but such a condition has never been seen post mortem and we believe it is of the nature of a leprous tracheitis or possibly bronchitis and is a reaction phenomenon and only seen during lepra reaction and that all signs subside after the reaction has come under control. The mouth, pharynx and larynx are involved in direct proportion to the severity of the disease. In advanced lepromatous leprosy although clinical signs may not always be prominent, *bacilli can usually be found on careful examination* in any of these situations. The first lesions are usually seen on the lips which may be *involved in the general infiltration* of the face or if the disease has extensively involved the lips they may present a large misshapen swollen appearance. On the other hand small flat topped nodules may be seen which may extend and become more pronounced. Along with the involvement of the lips the process extends to the tongue which may show no clinical signs but which sooner or later manifests gross lesions. These lesions may vary from a mild glossitis to a well marked geographical tongue with deep fissures

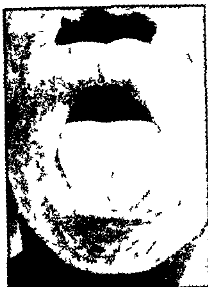


Fig 101



Fig 10



Fi 103



Fig 104

Les ns of th tongu show ng ly les ons gradually progres ing to d ep fis ring giv ng a mosai appearance

which at times give a mosaic appearance On the other hand actual nodulation of the tongue may be seen The nodules are usually seen on the anterior third or tip of the tongue but may extend over the whole organ The fissuring of the tongue which in the late stage is a prominent feature frequently extends to the lips and a painful raw cracked tongue and lips occur giving rise to much discomfort and sometimes intense pain It should be noted that marked ariboflavinosis may be associated with advanced leprosy and therefore the amount of involvement due to leprosy or to a deficiency of riboflavin cannot be gauged except therapeutically and therefore under treatment it will be stated that it is always worth while to treat as for a riboflavin deficiency first for such treatment may ameliorate some of the worst symptoms

The soft palate, hard palate and uvula may be all affected The leprous process spreads from the mouth and nasopharynx to the uvula and this may become grossly distorted bound down to the roof of the mouth or be destroyed altogether and in such instances there may be experienced definite difficulty in swallowing liquids or semi solid foods Sometimes when the uvula appears to have been destroyed it has actually been pulled back by the fibrous tissue which always forms in late stages of nasopharyngeal leprosy and may be found pointing up towards the posterior nares It should be remembered that ulceration of the hard palate leading to perforation occurs in leprosy and is not necessarily syphilitic in origin Syphilis may also be mimicked by the greyish slough on the tongue which resembles leukoplakia These conditions in leprosy therefore should be borne in mind and an anti syphilitic course should not be given unless the physician is convinced that the lesions are complicated by the presence of the spirochaete for to treat for concomitant syphilis when other signs and history of infection are absent may do more harm than good As pointed out the Wassermann reaction does not help for this is frequently positive in advanced lepromatous leprosy

**4 Lesions of the Larynx**

Leprosy of the larynx nearly always starts in the free extremity of the epiglottis This is inflamed and small granulations are seen on its surface From the epiglottis the disease passes to the cushion of the epiglottis the mucous membrane of the cuneiform and corniculate cartilages is involved and the disease extends to the false cords While nodules on the true cords are sometimes seen these are usually involved secondarily as a result of their becoming embedded in the surrounding granulomatous tissue

It is frequently extremely difficult to see the larynx in leprosy by ordinary indirect examinations for the epiglottis may be so enlarged inflamed or fibrotic that a view of the larynx is quite impossible The best technique for laryngeal examination in leprosy is to have the patient sitting in front of the physician on a slightly higher stool The patient opens his mouth wide bends his head slightly forward The tongue is grasped with a piece of gauze and gently pulled forward The mirror is inserted well back and the tongue slightly depressed This manoeuvre sometimes overcomes the difficulty of an enlarged epiglottis Those who are proficient and dextrous will find if the larynx cannot be seen because of an unduly large epiglottis that after cocainising the throat the epiglottis can be tilted out of the way by a retractor and a better view of the larynx obtained As the importance of recognising early lesions of the larynx is so great physicians taking up leprosy as a speciality would be well advised to become proficient in the newer methods of direct laryngoscopy for leprosy of the throat has been too often passed over as hopeless and no real attempt has been made as yet

except in Carville Louisiana really to study such conditions and attempt to ameliorate the symptoms or retard the progress of the disease

Leprosy of the larynx is seen in two forms

1 Fibrotic
2 Ulcerative

In the fibrotic form the tissue of the larynx reacts to the presence of the M leprae by a fibrous tissue reaction which produces immobility of the cords and so hoarseness of the voice The disease is slowly progressive and may lead to complete stenosis of the larynx A patient may carry on for years with little or no discomfort and die of some complicating disease before distressing symptoms of laryngeal stenosis occur

The ulcerative form is of very much more serious import For in this condition granulomatous tissue develops rapidly and there is a considerable increase of secretion giving rise to hoarseness pain and breathlessness Punched out ulcers form over the mucous membrane of the arytenoid and corniculate cartilages and in the region of the false cords and these become covered with a greyish or yellowish slough The danger to life in such cases is considerable for in the first place due to the extensive inflammatory involvement oedema of the glottis may suddenly arise and the patient die in acute distress or as a result of the rapidity of spread of the granulomatous process the rima glottidis may become so narrowed that signs of suffocation and distress arise necessitating an immediate tracheotomy Enough has been said to emphasise the need of constant vigilance in lepromatous leprosy The nose throat and larynx should be examined frequently and active palliative measures undertaken on the first appearance of any clinical signs of involvement of these structures Leprosy of the nose mouth pharynx or larynx is of such serious import that delay may result in much misery and distress to the patient It is these manifestations of advanced leprosy in the nose and throat that make the disease so feared and shed a pall of terror over it but the physician must endeavour to retain a sense of proportion and bear in mind that it is only a small proportion of all cases which manifest these advanced and almost terrifying aspects of the disease

## LESIONS OF THE EYE

The eye is one of the most valuable organs man possesses and is liable to be attacked in leprosy Therefore every patient suffering from leprosy should have a routine examination of the eye and this should be repeated at frequent intervals especially if there is any doubt as to the condition of any of the elements of the eye If active disease is discovered vigorous measures must be instituted at once Too often a defeatist attitude is adopted It must not be forgotten that careful observation intelligent and active treatment will prevent blindness in many cases and in others stave off that tragedy for a number of years The eye can be affected both in neural as well as lepromatous leprosy

### 1 Involvement of the Eye in Neural Leprosy

In neural leprosy the eye becomes secondarily affected owing to the involvement of the nerves supplying the muscles of the eye and cornea Lesions are produced as a result of the ensuing paralysis due to the invasion by M leprae particularly of the VIIth nerve and the ophthalmic division of the Vth nerve When the VIIth facial nerve

is involved paralysis of the orbicularis muscles ensues and lagophthalmus results When the first division of the Vth nerve is similarly involved anaesthesia of the cornea is a prominent sign Because of the anaesthetic cornea irritant particles get into the eye without being noticed If there is associated lagophthalmus the blinking reflex is lost and the lower pole of the cornea is uncovered when the patient is asleep In consequence inflammation sets in due to dust and wind irritation which shows itself in conjunctivitis and later the inflammatory reaction may so damage the cornea that actual ulceration follows Further owing to the lagophthalmos which is liable to occur the eye cannot be closed and when the patient attempts to close his eye in sleep the cornea remains uncovered and the delicate tissue becomes further devitalised There then appears an inflamed area at the lower pole of the cornea which at first simulates an arcus senalis but goes on to a soft mushy inflammatory mass with enlarged vessels this becomes organised and a dense opacity is the end result causing gross impairment of sight and the infective process may extend (? pyogenic) to the iris Thus the iris becomes secondarily involved is bound down to the scar and all the signs of chronic irritative iritis or iridocyclitis ensue *Hence the eye lesions in neural leprosy* are solely due to mechanical causes following paralysis of muscles and anaesthesia of the cornea and are in no way specific

## 2 Involvement of the Eye in Lepromatous Leprosy

The disease may extend to the eye in two ways

*(a)* By a process of spread probably through the lymphatics or directly through the naso lachrymal duct or over the lid margin to the conjunctiva



Fig 10 —Diffuse episcleritis

*(b)* Through the blood stream The ciliary body appears to bear the brunt of the infection

In one or other of these ways leprosy may affect the eye and all elements become invaded The different structures of the eye that become affected will now be described

(i) Sclera

Leprosy appears to affect the sclera in two ways

*(a)* A diffuse lepromatous involvement
*(b)* A circumscribed lepromatous involvement

(a) *A Diffuse Involvement*

The sclera may be involved without clinical signs for in a certain proportion of cases smears taken from the sclera in lepromatous leprosy may show M leprae Diffuse involvement of the sclera *in lepromatous leprosy is seen in two forms*

(i) Acute
(ii) Chronic

(i) *Acute* The acute form usually is associated with signs of the involvement of other elements of the eye e g iris The whole sclera and conjunctiva are affected and

there is much inflammation and pain It is inconceivable that a process of this nature should confine itself to the scleral tissues alone and it is almost certainly associated with extension of the disease from the ciliary body to the choroidal coat of the eye

(ii) *Chronic* This is a very common early sign of eye infection The eye looks quiet and there is no evidence of acute disease the cornea is clear and the pupils regular and react well but on examination especially in the region of corneo scleral junction more often laterally than medially is seen a discolouration of the sclera and signs of mild inflammation This involves the episcleral tissue and the spread is probably from the conjunctiva The affected portion of the sclera is of an orange colour and there is an increased vascularity Scrapings from the area will show numerous acid fast bacilli This condition may go on for months and years and never extend and clear up if the disease becomes quiescent On the other hand the process may become acute and not only cause pain and marked inflammation but extend to the iris and ciliary body resulting in an iridocyclitis Still another possibility is that the affection may extend throughout the sclera and a circum corneal inflammation is noticed The lepromatous tissue causing a certain amount of oedema gradually invades the cornea and obliterates in time the whole cornea When the process is as active as this none of the elements of the eye escape and blindness ensues It is in these cases one may see owing to thinning of the sclera tissue actual staphyloma



FIG 106 — Nodule on the [illegible] — removed by operation

(b) 1 *Circumscribed Lepromatous Involvement*

The infection here confines itself to one area and a lepromatous nodule develops This shows itself in a firm fibrous nodule which can be removed by operation On the other hand the nodule may be soft and more vascular and difficult to remove because it is impossible to define the borders of the leproma accurately

(ii) CORNEA

The cornea is very commonly affected with leprosy and the disease is seen in four forms

(*a*) A superficial keratitis
(*b*) Pannus formation
(*c*) Deep keratitis
(*d*) Corneal ulceration

(a) 1 *Superficial Keratitis*

This may commence as small white dots on the cornea or grey spots which coalesce and extend gradually involving the whole cornea No pain may be felt but when the process begins to spread the patient may complain of a mistiness of vision Vision is better in bright light than in dull light and spots appear in front of the eyes

Though superficial keratitis is first seen in discrete spots the whole area occupied

by the spots is inflamed Slit lamp examination will reveal this In the early stages there may be no other signs of inflammation

(b) *Pannus Formation*

In many cases the maculae are large and irregular blood vessels cross over the limbus on to the cornea and these under the slit lamp have been described as finger like processes Gradually a leprotic pannus is formed At other times the small spots coalesce and form a diffuse opacity Along with the spread of the process in the cornea further activity of the disease may be seen by the appearance of an exudate into the anterior chamber and extension of the inflammation to the iris and ciliary body It must be remembered that superficial keratitis is usually very slowly *progressive* and with active measures the progress of the disease is often arrested sometimes permanently at other times for several months or possibly years

(c) *Deep Keratitis*

This is a serious form of the disease and is a deep seated inflammation probably *spreading from the ciliary body* and is difficult to arrest and frequently extends over the whole cornea causing complete blindness Much can be done for the condition *but continuous watchfulness must be maintained for there is no pain and the patient* if ignorant does not realise the progressive nature of the trouble and inevitable blindness unless treatment and great care is exercised It must be pointed out that when the cornea is affected this may be the only outward manifestation of leprosy of the eye but *nevertheless all structures of the eye are involved and bacilli have by this time* spread by lymph and blood stream to every part of the organ

(d) *Corneal Ulceration*

This is liable to occur when there is extensive involvement of the eye especially in the more acute conditions and necessitates careful observation and active and im mediate treatment Unless treated vigorously a fibro purulent exudate is liable to occur in the anterior chamber but there is seldom free pus The scar resulting from such lesions gives rise to a dense opacity and great impairment of vision

(iii) Iris

Leprous infection of the cornea and sclera may be the result of blood stream infection of the ciliary body or the consequences of direct spread from surrounding tissues or through the naso lachrymal duct Iritis which occurs comparatively frequently is probably a blood stream infection this is almost certainly the case in acute iritis Leprosy can involve the iris in three ways

- (*a*) Acute iritis
- (*b*) Subacute iritis
- (*c*) Chronic iritis

(a) *Acute Iritis*

This may supervene on a subacute iritis but frequently the first indication that the eye is affected in leprosy is a sudden attack of acute iritis The usual symptoms are present viz photophobia pain and inflammation On examination the iris loses its lustre the pupil is fixed and small and the light reflex lost The iris becomes muddy

there is intense circumcorneal inflammation and there may be oedema of the conjunctiva If vigorous treatment is not instituted permanent damage will result In the acute stage there is danger of a fibro purulent exudate forming in the anterior chamber but as stated above free pus is seldom seen At the end of the attack if adequate treatment has not been given permanent damage to the iris follows

(b) *Subacute Iritis*

This usually follows on several attacks of acute iritis or from the start the infection may be a smouldering one with dull pain slight photophobia and fixed pupils A characteristic of subacute iritis in leprosy is said to be white spots on the iris These are seen frequently but are not constant The iris is irregular and bound down by the inflammatory process and unless active and vigorous treatment is instituted for the condition it will pass on to chronic iritis

(c) *Chronic Iritis*

This may be quiescent or mildly active so long as there is photophobia lachryma tion or pain the inflammation is active In the chronic stage the pupil is completely bound down by adhesions and a dense pupillary mem brane is formed which is impossible to break down by therapeutic means The extent of loss of vision depends on the amount of occlusion of the pupil

It is an extraordinary phenomenon that in spite of the complete occlusion of the pupil at times glaucoma seems to be a rare complication in a chronic iritis of leprosy In acute iritis however an acute secondary glaucoma may be seen due to blocking with the inflammatory products of acute iritis but in the Lady Willingdon Leprosy Sanatorium during a period of ten years only half a dozen cases of glaucoma have been seen although there is a large number of patients with dense pupillary membranes and partially or com pletely occluded pupils due to past attacks of iritis This is probably due to the fact that the brunt of the attack in leprosy of the eye is borne by the ciliary body which in all probability is destroyed



Fig 107 — Chron[illegible] it[illegible] [illegible]wing whi[illegible] [illegible]pot[illegible] [illegible] nd two o clock

Any structure of the eye may become involved and iritis never occurs without corresponding affection of the ciliary body resulting in what is really an irido cyclitis No fundus changes have been described in leprosy but that may be because by the time the fundus is involved the cornea is so affected or the iris so bound down that it is impossible to see it In cases where the disease affects the iris it becomes very brittle and an iridectomy may be an extremely difficult operation

Opacity of the lens resulting in cataract is comparatively common and the chronic inflammatory condition of the structures around the lens must be a predisposing factor in the formation of this condition

As has been pointed out when lepromatous leprosy extensively affects the eye all the elements of the eye become involved and the lepromatous process may then invade

the anterior chamber resulting in the formation of exudates Along with the iritis and irido cyclitis patients may get periodic attacks of eye pain which are sometimes of great severity The attacks pass off and may recur at varying intervals and indicate extensive involvement of the whole uveal tract Unlike pan ophthalmitis due to sepsis there is no oedema of the eyelids

For those who wish to study in detail the changes in the iris in leprosy the excellent monograph by De Barros (1938) and reprinted in the *International Journal of Leprosy* (1940) should be consulted

Leprosy of the eye is a rich field for investigation especially in connection with the study of the various types of iritis and of the fundus in cases of generalised leprosy with clear ocular media Further ophthalmologists who wish to study the pathological conditions which affect the eye could not do better than spend 3–6 months in an intensive investigation of eye lesions in a modern leprosarium

CHAPTER XII

# TREATMENT OF LEPROSY

**Introduction**

Probably there is no disease which calls for more ingenuity in the matter of treatment on the part of the physician than leprosy. So long as there is no specific treatment for the disease the therapeutics of leprosy will remain one of considerable difficulty. Nevertheless while in many ways the disease is hard to treat and the results very variable and not a little disappointing yet a proper understanding of the therapeutics of leprosy will result in the relief of a large number of sufferers and the amelioration or prevention of the more distressing symptoms of the majority. The physician treating a case of leprosy must maintain a reasonably hopeful outlook even when the chances of complete recovery are limited for constant vigilance careful treatment and a cheerful outlook will gain the confidence of the patient and do more than anything else to help recovery. In a disease whose treatment is so little understood the psychological outlook both on the part of the patient and of the physician is of extreme importance. The influence the mind has over the body in disease is receiving ever increasing attention and in leprosy where the mental reactions are so great the importance of a well balanced mental approach cannot be too strongly stressed. It is just here that the challenge particularly comes to the Christian doctor for he is equipped in a special way to deal with the many difficulties patients have to face when they are afflicted with a chronic and largely incurable disease. I feel I must at this point state quite emphatically that without a firm belief in Christ I should find it difficult to give any kind of answer to the problem of suffering and without some answer to this age long riddle it is impossible to approach the treatment of a chronic and to some extent greatly mutilating disease in a frame of mind which will enable the patient successfully to face the long up hill road to renewal of health.

In considering the therapeutics of leprosy a clear understanding of its pathology is necessary and it is to be remembered that in those forms of leprosy where there is active defence the body is dealing quite effectively with the disease and the physician's task is to minimise any damage which is liable to follow as a result of this defensive process. Therefore in treating leprosy it is not only a question of treating the disease but of preventing if possible its further progress and at all times the physician has to ask himself What special measures must be taken to overcome any deformity which is likely to ensue? Hence it will be readily understood that the therapeutics of leprosy is a subject which is not only complicated but requires long experience and patience if success is to be attained.

Much has been said about the necessity of dealing with predisposing diseases. While it is only reasonable to treat any concomitant infection or complicating condition too much reliance should not be placed on the results after this has been done for as pointed out in the earlier chapters the progress or retardation of leprosy seems to bear little relationship to the general health of the patients and in the past predisposing diseases and debility of the patient have been put forward as the causes for lack of success of treatment when all along the real reason has been our ignorance of more efficient and

active therapeutic measures Nevertheless because leprosy is a chronic disease of long duration patients frequently suffer from concomitant disease both acute and chronic besides they have the ordinary liability to parasitic infections of all kinds Therefore any complicating condition should be treated and as far as possible eliminated Generally speaking if the complicating condition is acute special treatment should be withheld but in the more chronic diseases (e g syphilis) these may be treated along with leprosy In the case of tuberculosis and leprosy because the former is a comparatively more serious and acute disease one s whole attention should be concentrated on it rather than on the leprosy

With regard to special remedies it cannot be too strongly stressed that no departure should as yet be made from the well tried and accepted derivatives of hydnocarpus oil The general public and not infrequently the medical profession are often deceived by extravagant claims of firms who wish to bring to the attention of the public special drugs of their own Two principles should be remembered avoid the newest remedies and avoid the more expensive remedies

Before the general principles of administration of hydnocarpus oil are described it might be of interest and of some value to refer to remedies which have from time to time been in vogue in order to illustrate how many remedies have been used and emphasis the care needed before any therapeutic claim can be established At the end of the nineteenth century Radcliffe Crocker advocated mercurial preparations This is of interest because the ingredients of many of the Indian indigenous remedies contain mercury and this possibly accounts for the frequency of reactions after treatment by persons practising indigenous medicine A few of the more important of the remedies which have been or still are in vogue will now be discussed

**Potassium Iodide**

Our general experience with this remedy is such that its use is not advocated In skilled hands and in carefully selected cases there may be some benefit but in a disease in which there are so many variable factors and which ordinarily shows periods of remission it is almost impossible to say whether in the few cases which show favourable results that some other factor is the cause for the improvement and not the drug It has been said by the advocates of potassium iodide that treatment can be controlled by the sedimentation index test but as has been pointed out this test in our opinion is not a sufficiently reliable one on which to depend in the control of treatment Potassium iodide is not recommended because of the danger of its precipitating reactions even in small doses Therefore it is better avoided altogether No prescription in the Lady Willingdon Leprosy Sanatorium contains potassium iodide Anyone who has had considerable experience in an institution will bear out the danger of its administration for not a few patient have been crippled as a result of reactions in nerves and blinded through the flaring up of eye lesions It is therefore advisable to avoid iodides entirely in the treatment of leprosy or of any concomitant diseases which are ordinarily treated with iodides e g bronchitis syphilis etc

Some advocate provocative doses of iodides in order to produce a nasal discharge in the hope that a diagnosis may be made This in our opinion is entirely unjustified Firstly because nasal lesions are seldom or never primary secondly because of the danger of precipitating reactions

It should be remembered that potassium iodide has from time to time been used

in leprosy and that the father of modern leprosy Armour Hansen recognised its dangers and stated in his classical monograph that even small doses of iodides produce new eruptions and patches

**Arsenic**

Preparations of arsenic were used by the earlier physicians and the late Dr Daniel sen used it in the form of Fowler s solution in increasing doses and came to the conclusion that the apparent good was due to the emaciation produced but when that was recovered from the nodules gained their previous size ! Arsenic was re introduced by Hasson (1922) but has again rightly fallen into disfavour

**Antimony**

Antimony preparations have been extensively used especially by Cawston (1920) Rodriguez and Fubinus (1926) carried out a series of experiments on the value of antimony in leprosy and came to the conclusion that antimony appears to be of no therapeutic value as a means of treating leprosy In our experience as will be pointed out later antimony is only of value in lepra reaction and should not be used except for this condition

**Copper**

Within recent years copper in colloidal form has been extensively used but these preparations are now in disfavour for there is no conclusive evidence that they are of any general value in the treatment of leprosy In so far as it appears that heavy metals in small doses tends to control reactions the value of copper may be in this direction but there are other and safer remedies which can be used and therefore copper and its derivatives are *not* recommended

**Sera and Vaccines**

As far back as 1890 Carrasquilla recommended serum therapy Since then there have been many advocates of serum or vaccine treatment and the best known are Rost (1905) Deycke Williams and more recently Reimsterna (1938) have all advocated preparations of vaccine and sera but as no serum or vaccine has been of proved useful ness there seems little value in detailing the various acid fast organisms used in their preparation or in describing the treatment in detail Sufficient is it to say that all such remedies have largely gone out of favour and as far as it is known are not used now in India or the East

**Aniline Dyes (Trypan Blue, Brilliant Green, etc )**

Some years ago aniline dyes were advocated for the treatment of leprosy In this connection it is interesting to note that these substances are employed in the technique of intra vital staining of the macrophages or wander cells of the reticulo-endothelial system Many in this group having strong antiseptic properties it was therefore reasonable to conclude that they would have an effect on the M leprae In the fair skin it was interesting to note that the lepromatous lesions of leprosy were stained the colour of the dye used showing that the substance was absorbed by the lepra cells in the corium However although some cases showed improvement there was no evidence that the dyes had any effect on the bacilli themselves This once again emphasises the parasitic nature of M leprae and hence the difficulty of attacking it by ordinary antiseptics

The aniline dyes like so many remedies are now no longer recommended in the routine treatment of leprosy

**Sulphonamides**

As the sulphonamide products were certain to arouse hopes in the treatment of leprosy a trial of sulphapyridine—acknowledgments are due to Messrs May & Baker for generous samples—was undertaken at the Lady Willingdon Leprosy Sanatorium in 1940 and after six months the experiment was abandoned and the following is a summary of the experiment Nine cases in all have been treated Two patients had two courses of treatment one patient had three courses and the other six had one



Fig 108 —Acute reaction after administration of M & B 693 in lepromatous *leprosy*



Fig 109 —Reaction subsided after stoppage of drug and patient improved on *standard treatment and was sub*sequently discharged as negative

course Early in the experiment it was found that the administration of M & B 693 tended to precipitate lepra reaction with in some cases high fever In one case this was accompanied by actual ulceration of the lesions The initial dose was two tablets twice a day increasing to six tablets but it was found that few patients could tolerate a dose of six tablets continuously and that nausea and vomiting ensued The average dose was therefore reduced to three tablets in some instances and four in others This dose was maintained until a reaction occurred When the fever was definitely established the drug was stopped and the antimony products administered to control the fever In those who had more than one course a month s rest was given and then M & B 693 was resumed in the same dosage In addition to this sulphonamide in the form of a paste was used for certain types of ulceration *The following conclusions were arrived at*

(*a*) The remedy is liable to produce acute lepra reaction and in some cases this is exceptionally severe

(b) There is no evidence that the patient's leprosy condition is benefited by M & B 693

(c) There seems to be a greater tendency for nausea, alterations in pulse rate and drug dermatitis to occur in leprosy patients than in persons suffering from other diseases

(d) The sulphonamide preparations in the form of a paste have a decided place in the treatment of certain types of trophic ulcers

(e) It has been noted however that where M & B 693 or other sulphonamide is specifically indicated (e g pneumonia or septic conditions) it can be given without difficulty

(f) The sulphonamides appear to have no influence on leprosy and should not be used unless there are specific indications for its use

Since this work Dharmendra (1944) and his colleagues have carried out experimental work on sulphapyridine in rat leprosy with the following conclusions

Under the conditions of the experiment described sulphapyridine has failed to modify the course of experimental rat leprosy in white rats. The drug does not appear to have an inhibitory effect *in vivo* on the Mycobacterium lepræ muris although *in vitro* it has been known to have a bactericidal effect in a 1 in 1 000 dilution

**Diphtheria—Formal Toxoid**

Oberdoeffer and Collier (1939) following the development of the theory that a tuber of the Colocassia antiquorum family eaten as a staple diet was an epidemiological factor in the acquirement of lepromatous leprosy suggested that the administration of diphtheria anti toxin or of diphtheria toxoid might be an effective treatment of leprosy. Cochrane (1941) and Chaterjee (1942) have not confirmed this work and Wade (1941) and Low (1942) both appealed for further trials. As far as is known the administration of diphtheria toxoid has fallen into disuse and is not now recommended. The earlier hopes of these workers have been shattered by more recent work

**Promin and Diasone**

The latest remedies to be advocated are the new products related to the sulphonamides—the promin group. Faget (1944) reported recently that promin in massive doses was more effective than any other treatment at present known for leprosy. Readers are warned however not to use such remedies until they have been much more extensively tried out under adequate experimental conditions. The author has recently had the privilege of personal conversation with Faget and his co workers and while he maintains a cautious attitude considers that the results are significant and that these remedies deserve a further and more extensive trial. Faget and his co workers state that promin diasone or promizole is equally effective in treatment

A word may not be out of place on the question of the technique of testing remedies claimed to be effective in leprosy. In the first place before any physician can evaluate a given drug he must be able to diagnose the type of disease accurately and confirm his diagnosis histologically. The more active tuberculoid cases and especially the large group of atypical intermediate or border line cases sometimes simulate lepromas so closely that confirmation of the classification by biopsy is essential. The wisdom of this will be understood if it is realised that two or three atypical cases in a small group chosen for a therapeutic experiment may vitiate the whole test. further an apparent

dramatic recovery becomes so firmly fixed in the mind of the physician that he is apt to draw conclusions from the exceptional rather than the general Hence one should not undertake the testing of new remedies seriously unless firstly there are facilities for histological work and a person sufficiently experienced to interpret the sections and secondly the remedy should be under trial from six months to two years Six months will be *sufficient to disprove a remedy* but confirmation of initial favourable results needs at least two years If every one would avoid publishing the results of treatment for two years much disappointment would be avoided for it is to be remembered that the person with advanced lepromatous leprosy is only too ready to grasp at any therapeutic straw and it is both unkind to the patient and unscientific to publish the result of remedies either not properly tried or tried for too short a period on only a few patients In any case when in doubt only lepromatous cases established histologically should be used to test out new remedies

### Diet in the Treatment of Leprosy

The question of diet is often raised All that can be said at present is that a general all round well balanced diet should be given In children skimmed milk is of value if there is a vitamin B deficiency and in adults who complain of bone and nerve pain wheat in place of rice is of definite benefit Eight ounces of skimmed milk (Acorn brand) i e one ounce of powdered milk to eight ounces of water should be prescribed whenever there is evidence of angular stomatitis As has been stated there is no conclusive evidence that special diet affects any condition other than the deficiency for which it is given There is little proof that dietary improvements make any substantial difference in the treatment of leprosy

### Chaulmoogra Oil in the Treatment of Leprosy

As has been stated the only remedies which have been consistently advocated over the past two decades have been derivatives of chaulmoogra oil and while these are not claimed to be specific they have not as yet been bettered and it is recommended that the hydnocarpus (chaulmoogra) derivatives be used as the treatment of choice Their method of action is still unknown The following theories have been suggested

1 Hydnocarpus preparations dissolve the fatty capsule and liberate bacilli so that they can be dealt with in other words as Muir used to say of such drugs they may act by lepromalysis

2 There may be still an undiscovered active principle which exists in such small quantities so that large doses must be administered for it to have any effect

3 Intradermally it may act in some way on the nutrition of the bacilli and render the environment unfavourable to its multiplication

A study of the chapters on Pathology and Immunity will indicate to the reader that an investigation into this latter reason may be a most profitable line of future research We believe that if the nutritional state of the tissue comprising the corium could be so altered that M leprae could not multiply then leprosy would cease to be a progressive disease for as already stated I am of opinion that the M leprae cannot multiply and cause active disease unless they are disseminated via the skin It is suggested that research might be concentrated on the skin and on methods to affect the nutritional state of the bacilli in the corium This method of research falls into line

with the modern theories of the sulphonamide group of drugs because it is generally held that it is the environment which is so altered that the bacilli can no longer multiply and not a specific bactericidal action which makes these drugs so effective to certain bacteria

The only conclusion at present drawn is that no substance as effective as the hydnocarpus derivatives has as yet been definitely discovered and therefore unsatisfactory as many of the results are these are the only remedies which can at present definitely be recommended for the routine treatment of leprosy

### Hydnocarpus Oil (Chaulmoogra Oil)

The oil from the following species has been used in the treatment of leprosy

Hydnocarpus wightiana (West coast of India)
Hydnocarpus anthelmintica (Siam and Burma)
Taraktogenus kurzii (Hydnocarpus kurzii) (Burma)
Cynocardia odorata (false chaulmoogra) (Burma)



Fig 110 Method of giving intradermal injection in leprosy Note the small weal raised at the point of injection

Of the above remedies the only preparations which are universally used are Hydnocarpus wightiana and Hydnocarpus anthelmintica

Hydnocarpus oil must be extracted from fresh seeds and by the cold process good oil should be of a golden colour with no sediment and have an optical rotation of 50 degrees and an acid content of not more than 0 ( per cent usually clear golden coloured oil is not irritant Milder degrees of irritation can be overcome by treating the oil with activated charcoal The final test of good oil is whether it gives pain on injection The following preparations of the oil are in use

(i) *Pure hydnocarpus oil*
(ii) Ethyl esters
(iii) Salts of the fatty acids of hydnocarpus oil the one most commonly used is sodium hydnocarpate (Alepol—Burroughs Wellcome)

The method of administration of the hydnocarpus preparation has varied and the following routes have been advocated from time to time

1 Oral
Subcutaneous
3 Intradermal
4 Intramuscular
5 Intravenous

The generally accepted methods are by subcutaneous intramuscular or intradermal injection Hydnocarpus oil by mouth appears to have a limited application Intramuscular injections are inconvenient and intravenous medication should never

be employed as a routine method and certainly never where oily solutions are in use

For ordinary routine treatment two preparations are to be recommended

(i) Hydnocarpus oil with 0 5 per cent creosote
(ii) Ethyl esters of hydnocarpus oil in the following proportions

| | |
|---|---|
| Ethyl esters | 75 parts |
| Olive oil (or hydnocarpus oil) | 25 parts |
| Creosote | 1 part |

Iodised esters and iodised oil have been advocated from time to time Great care is necessary in the preparation of these remedies and readers who wish to use them are advised to procure them from reputable firms for facilities in the ordinary laboratory of an average leprosy institution are usually not sufficiently developed to undertake their preparation On the other hand the preparation of ethyl esters is a comparatively simple matter and details of the preparation are added as an appendix to this chapter It *may be helpful* to those who are not in touch with reliable sources of supply to indicate firms whose products have been proved to be reliable Generally speaking it is advised to order the pure hydnocarpus oil direct from the west coast of India and Messrs Ernakulam Trading Co Ernakulam supply a pure oil The oil is pure if golden yellow colour without sediment and perfectly clear Oil which is in any way opaque or cloudy with a sediment should be rejected It is preferable to transfer all oil into glass containers and not retain it in the tins in which it is dispatched This procedure prevents the formation of irritant products due to oxidisation

Ethyl esters of good quality iodised or creosoted (undistilled) can be had from Smith Stanistreet Calcutta or De & Co Calcutta or from the Madras Medical Stores The former two firms prepare a satisfactory iodised ester

*Before the war (1939-45) the laboratories of the International Institute of Leprology* Rio de Janeiro prepared an excellent product of iodised esters which in a limited trial at the Lady Willingdon Leprosy Sanatorium (1940) gave promising results A word of caution must be issued with regard to the administration of iodised products These must be injected at once and the balance never put back into the original bottle and on no account must moisture be allowed into the esters Exposure to air for any length of time and the introduction of minute particles of water result in an intensely irritating product While this remark applies *particularly* to the iodised esters of hydnocarpus oil they are generally applicable to all preparations in which there is iodine *in loose combination To a less extent the creosoted oil and esters are sensitive to air* and moisture and on no account should any surplus be returned to the original bottle

In addition to the above firms Messrs Burroughs Wellcome London supply creosoted hydnocarpus oil creosoted and iodised esters under the trade name Moogrol and ' Iodised Moogrol

Hydnocarpus oil should be sterilised and given subcutaneously or intramuscularly and the ethyl ester mixture given intradermally The subcutaneous route is preferable to the intramuscular *but not more than 3 c c should be injected in one place* The higher dosages should be divided the places of choice are the outer aspects of the *thighs* arms and buttocks The following is the technique for intradermal injections as advised by Muir (1930)

' An all glass or record syringe with a fine needle fitted with a guard is used The

skin having previously been painted with spirit or iodine the needle is then introduced into (and not under) the skin The thickness of the skin varies in different parts of the body where it is thin the needle is introduced in a sloping manner so as to form an acute angle with the skin Where it is thicker then it is preferable to insert the needle at right angles With a little practice the technique is soon mastered and one finds little difficulty in injecting into the corium and not into the subcutaneous tissues An amount of the drug is injected so as to raise a weal of about one third of an inch in diameter If a large area is to be injected it is completely infiltrated some thirty punctures are necessary to inject about 3 c c of the esters Each injection should be separated by about a quarter of an inch about six to twelve punctures are needed to inject 1 c c

No mention has been made of the sodium salts of hydnocarpus oil The best known goes under the trade name of Alepol (Burroughs Wellcome) It is our belief that these remedies are not effective in the treatment of leprosy They may cause irritation subcutaneously and ultimately result in blockage of the veins if given intravenously

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CHAPTER XIII

## TREATMENT OF LEPROSY—*continued*

*While it was pointed out in the* previous chapter that little is understood concerning the part concomitant diseases and debilitating conditions play in the therapeutics of leprosy it is wise to deal with such conditions, adequately treat them and where possible eliminate them In any discussion on treatment the subject naturally falls under the following heads

1 *Treatment of neural cases*
2 Treatment of lepromatous cases
3 Treatment of children

### I Treatment of Neural Leprosy

It is a well known fact that neural leprosy particularly has a great tendency to spontaneous cure or disappearance and that only a small proportion of such cases are liable to become lepromatous Further to understand the treatment of leprosy especially neural leprosy we must bear in mind what was said with regard to the pathology of leprosy in respect to tissue reaction that every reaction of the tissues to invasion by M leprae is defensive In certain forms of neural leprosy this reaction is seen in successful defence and therefore if the body is dealing with the organism satisfactorily there may be no need for us to interfere with excessive treatment and in many cases no treatment at all may be the best advice that can be given to a patient *However until the practitioner in the tropics is really familiar with the vagarie of* the disease a wise principle is when in doubt—treat

The treatment of leprosy will now be discussed for each separate type and subtype

*Simple Macular Lesions*

The method of treatment is both local and general The hypopigmented areas should be stimulated as much as possible in order that pigment may be encouraged to form There are two methods of doing this

1 Painting the lesions with a counter irritant
2 Intradermal injections

1 *Trichloracetic Acid* Patches should be painted with this acid but it must be remembered that it is an irritating acid and unless care is exercised ulceration and actual keloid formation may result Therefore only a small area should be painted at a time *and the acid should be allowed to dry* before more is again put on When dry the appearance of a fine dusting powder should be seen if the appearance is that of ash then too much has been put on and the acid should be neutralised with moist sodium bicarbonate *Only a few patches should be painted at one time*

2 *Intradermal Injections* If the patches are not responding to trichloracetic acid or if the progress is not sufficiently encouraging then intradermal injections should be given into the lesions as well Between painting the patches with trichloracetic

acid there should be an interval of ten days and no lesion should be re intradermalled under one month and preferably six weeks While one set of lesions are painted with trichloracetic acid another set is given intradermal injections Intradermal injections tend to stain the skin but this discolouration though slow in disappearing will fade in six months to two years Discolouration of the skin however is not a counter indication to intradermal injections The great tendency for hyperpigmented spots to appear after intradermal injection should be borne in mind when injecting the face and especially is this the case in the treatment of women Because there is little evidence of the benefit neural cases receive apart from measures which involve counter irritation it is considered advisable to commence treatment by giving intradermal injections first into all the lesions commencing with those showing most anaesthesia After the patient has become used to the injections then the other lesions can be injected The commencing dose for intradermal injections of the ethyl ester mixture is 1 c c increasing by 1 c c each week until 5 c c are injected Many workers advocate subcutaneous injection of hydnocarpus oil and these may be given in addition to the intradermal injections of the esters It is recommended however that the patient be first given intradermal injections and when he has reached a dose of 5 c c intradermally subcutaneous injections of hydnocarpus oil and 0 5 per cent of double distilled creosote be given These injections may be given on the same day or if more convenient on another day of the week The commencing dose after 5 c c of ester is reached is 1 c c increasing by 0 5 c c each week until 10 c c is given It must be remembered that 5 c c of the esters mixture is continued all the time the hydnocarpus injections are being given and therefore the maximum dose is 15 c c per week When this dose is reached it is given ten times after which the patient is given a month s rest After a month s rest intradermal injections are started at 2 c c increasing by 1 c c each week up to 5 c c then as before if felt desirable hydnocarpus oil injections are commenced again starting at 2 c c and gradually reaching the maximum dose of 10 c c

**II Treatment of Minor Tuberculoid Leprosy**

It is to be borne in mind that all minor tuberculoid leprosy is a form of active tissue response and when there is one or at the most only two lesions of small size then the best procedure is to excise the whole lesion and ask the patient to return every six months for observation When the lesion is too large to excise or there are too many then intradermal injections should be given as described until the whole patch or patches have been injected then a month s rest prescribed and treatment re commenced on the above lines until the patch has been converted into scar tissue

**III Treatment of Major Tuberculoid Leprosy**

As has been pointed out major tuberculoid leprosy represents the most active tissue defence and the more active this defence that is the more acute the lesions the less active treatment is necessary Any major tuberculoid lesions which are markedly erythematous or scaly should not be given intradermal injections We are of opinion that in these instances no treatment with hydnocarpus oil is necessary for the tissues are effectively dealing with the M leprae and therefore there seems no point in interfering When the patches are not markedly erythematous especially in the more chronic fibrous type of lesions which may show gross infiltration then intradermal injections

at weekly intervals appear to be the most *rational treatment* These are continued until all lesions are healed and the dosage is increased up to a maximum of 5 c c or to that amount which is sufficient to infiltrate all the lesions

Some workers advocate subcutaneous injections in addition These may be given along the lines laid down for simple macular leprosy but the writer himself sees little point in giving subcutaneous injections

## IV Treatment of Lepromatous Leprosy

The question of building up the health of the patient and the rectifying of any deficiency or concomitant disease is stressed by many writers particularly by Muir It seems reasonable to conclude that if there are complicating factors the clearing up



FIG 111 —*Major tuberculoid leprosy showing acute reaction with marked scaling lesion of buttock*



FIG 11 —*Similar lesion on face* Lesions cleared up within three months but unfortunately the patient succumbed to m l ary tuberculosis

of these will naturally help in combating leprosy But just because a patient is not responding to treatment it need not be assumed that this failure is due to some as yet unrecognised dietetic deficiency or to a poor general state of health It is often suggested with too much facility that these causes underlie deterioration in leprosy when the real factor is often unknown and needs more intensive study Our inability in many cases to attain better results is largely due to our imperfect method of treatment and our still all too inadequate state of knowledge While making such a statement the importance of a thorough physical examination and the treatment of dietetics and other complicating factors should not be overlooked If such conditions are discovered then there may be a much better chance of recovery when these conditions are relieved It is sometimes the strong healthy well built muscular adult with no discoverable predisposing cause who is most difficult to treat

A great deal has been written with regard to diet in leprosy but there is little evidence that this plays a vital part in its treatment A good all round diet should be aimed at where possible rice should be substituted for wheat and a proportion of sprouted gram lentil or other wholesome cereal should be added to the diet In children with angular stomatitis sore tongue or other signs of vitamin B complex deficiency skimmed milk forms a useful addition to the dietetic regime

While the treatment of lepromatous leprosy is in many ways disappointing yet much can be done to relieve the patient of his distress prolong the usefulness of his life and in many instances arrest the disease for several years and sometimes permanently Nevertheless while modern treatment is in many ways not entirely satisfactory as far as lepromatous leprosy is concerned yet by careful treatment especially in the earlier cases there is a reasonable chance of the patient becoming non infective and his disease quiescent if not permanently arrested The relapse rate however is still disappointingly high

The sheet anchor of our treatment in lepromatous leprosy as in neural is hydnocarpus oil and its derivatives A great number of opinions have been expressed in respect of the optimum dose of hydnocarpus oil for lepromatous leprosy Further much thought has been given to the question as to whether intradermal or subcutaneous injections or both should be given In spite of several years experimentation and this is still being continued no light has been shed on the question of the optimum dose of the hydnocarpus preparations While we consider small doses under 5 c c of little value there is as yet no definite evidence that large doses above 15 c c are of any more value Hence we recommend for routine treatment a maximum do e of 15 c c Further we consider the most rational treatment is by intradermal injection and we feel that the patient should start with intradermal injections and then go on to subcutaneous injections The following tables summarising an experiment on the optimum dose give a comparison between the various methods of *injection at the Lady Willingdon* Leprosy Sanatorium and lend support to the contention that intradermal and subcutaneous injections are better than either alone

TABLE XIV

| Negative | Much Improved | Improved | Stationary | Worse | Total |
|---|---|---|---|---|---|
| | | *Intradermal Group* | | | |
| 4<br>3 5% | 13<br>11 4% | 29<br>25 4% | 39<br>34 3% | 29<br>25 4 | 114 |
| | | *Subcutaneous and Intradermal Group* | | | |
| 15<br>13 0% | 26<br>22 6% | 24<br>20 8% | 30<br>26 1% | 20<br>17 8% | 115 |
| | | *Subcutaneous Group* | | | |
| 2<br>3 9% | 7<br>13 7% | 2<br>3 9% | 20<br>39 2 | 20<br>39 2% | 51 |

9

TABLE XV

| Final Result | Average Period of Treatment | | |
|---|---|---|---|
| | Subcutaneous and Intradermal Group | Intradermal Group | Subcutaneous Group |
| Negative | 2 years 1 month | 3 years 1 month | 3 years 10 months |
| Much improved | 1 year 10 months | 2 years 2 months | 2 years 8 months |
| Improved | 1 year | 1 year 6 months | 2 years |

*In out patient clinics where numbers are excessive it* is a sound policy only to give 2 c c a week to patients until they demonstrate their willingness to persevere with treatment after which a planned course of treatment as will now be described can be chalked out

In lepromatous cases it is wise to commence treatment cautiously and therefore *the commencing dose should be 0 5 c c of the ethyl ester mixture intradermally* In starting intradermal injections it should be borne in mind that there is generally speaking no loss of sensation in lepromatous patches hence this method of injection is sometimes very painful Therefore the less sensitive sites should be chosen to commence with—e g outer aspects of extremities buttocks The physician however *must remember that while every sympathy must be given to the patient he must* encourage him to endure the pain of the injection because the battle of leprosy is only won by perseverance and a determined mind Hence because of the nature of the disease every effort should be made to keep the patient cheerful and optimistic maintaining his morale in such a way that the patient neither loses heart in the remedies *employed nor his confidence in the physician treating the case*

In starting treatment in lepromatous cases it is recommended that intradermal injections be started once a week using the ethyl ester mixture The commencing dose is 0 5 c c increasing by 0 5 c c until 5 c c is reached When the patient has got up to 5 c c intradermally this dose is maintained and preferably on a second day in the week at about three days interval subcutaneous injections of hydnocarpus oil are commenced The dose is 0 5 c c increased by 0 5 c c each week until 10 c c is reached *That is a patient is slowly pushed up until a maximum of 15 c c (i e 5 c c ethyl ester mixture intradermally 10 c c hydnocarpus oil subcutaneously) is given on two separate days in the week* This maximum dose is maintained for ten weeks and then the patient is given a month s rest At the end of the month provided there have been no setbacks the patient commences with 1 c c ethyl esters intradermally going up to 5 c c by 0 5 c c weekly increments After 5 c c ethyl esters is attained then subcutaneous injections of oil are *again started the dose is 2 c c* increased by 0 5 c c each week until 10 c c is reached In this way successive courses of treatment are pursued until all the lesions are negative All bacilli bearing lesions are injected until the whole body is covered An interval of a month should be allowed before the same area is again injected intradermally

If circumstances do not permit of the patient coming twice a week for injection then when the patient is ready for subcutaneous injections they may be given on the same day It must be borne in mind that in this case greater care must be exercised in the gradual increasing of the dosage The maximum dosage is still 15 c c i e 5 c c intradermally and 10 c c subcutaneously

Some writers have described symptoms of intolerance to the hydnocarpus remedies



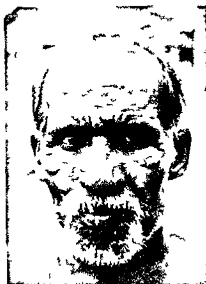


FIG 113 FIG 114

Advanced nodular leprosy showing result of treatment after intensive intradermal injection

in the form of nephritis dimness of vision and nausea We have had no experience of this although many thousands of cases must have been treated for prolonged periods

V Treatment in Children

Little need be said about treatment in children except that while intradermal and subcutaneous injections should be given to children there is an age limit and most workers feel that children of seven and under are hardly likely to stand up to such methods of treatment It is always advisable to treat children away from their parents and preferably along with other children It is remarkable how even little children will *stand up to and will ask for intradermal injection when the environment is* favourable and the doctor of an understanding nature

In children of five years and under hydnocarpus oil by mouth is worth a trial although no claims are made for this method Children from 2–4 years should commence with 1 minim t d s in a little milk or a lump of sugar and this dose should be slowly increased until the patient is given 3 minims t d s In those cases where the environment is such that a child will not take injections then oil by mouth may be given and the dosage for children from five years of age to seven is 7 minims t d s The maximum

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In starting treatment in lepromatous cases it is recommended that intradermal injections be started once a week using the ethyl ester mixture The commencing dose is 0 5 c c increasing by 0 5 c c until 5 c c is reached When the patient has got up to 5 c c intradermally this dose is maintained and preferably on a second day in the week at about three days interval subcutaneous injections of hydnocarpus oil are commenced The dose is 0 5 c c increased by 0 5 c c each week until 10 c c is reached That is a patient is slowly pushed up until a maximum of 15 c c (i e 5 c c ethyl ester mixture intradermally 10 c c hydnocarpus oil subcutaneously) is given on two separate days in the week This maximum dose is maintained for ten weeks and then the patient is given a month s rest At the end of the month provided there have been no setbacks the patient commences with 1 c c ethyl esters intradermally going up to 5 c c by 0 5 c c weekly increments After 5 c c ethyl esters is attained then subcutaneous injections of oil are again started the dose is 2 c c increased by 0 5 c c each week until 10 c c is reached In this way successive courses of treatment are pursued until all the lesions are negative All bacilli bearing lesions are injected until the whole body is covered An interval of a month should be allowed before the same area is again injected intradermally

If circumstances do not permit of the patient coming twice a week for injection then when the patient is ready for subcutaneous injections they may be given on the same day. It must be borne in mind that in this case greater care must be exercised in the gradual increasing of the dosage. The maximum dosage is still 15 c c, i e 5 c c intradermally and 10 c c subcutaneously.

Some writers have described symptoms of intolerance to the hydnocarpus remedies



Fig 113

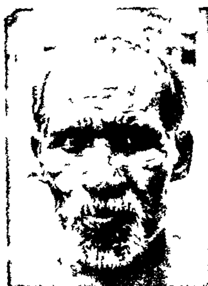


Fig 114

Advanced nodular leprosy Following result of treatment after intensive intradermal injection

in the form of nephritis, dimness of vision and nausea. We have had no experience of this although many thousands of cases must have been treated for prolonged periods.

## V Treatment in Children

Little need be said about treatment in children except that, while intradermal and subcutaneous injections should be given to children, there is an age limit and most workers feel that children of seven and under are hardly likely to stand up to such methods of treatment. It is always advisable to treat children away from their parents and preferably along with other children. It is remarkable how even little children will stand up to and will ask for intradermal injection when the environment is favourable and the doctor of an understanding nature.

In children of five years and under hydnocarpus oil by mouth is worth a trial although no claims are made for this method. Children from 2–4 years should commence with 1 minim t d s in a little milk or a lump of sugar and this dose should be slowly increased until the patient is given 3 minims t d s. In those cases where the environment is such that a child will not take injection, then oil by mouth may be given and the dosage for children from five years of age to seven is 7 minims t d s. The maximum

TABLE XV

| Final Result | Average Period of Treatment | | |
|---|---|---|---|
| | Subcutaneous and Intradermal Group | Intradermal Group | Subcutaneous Group |
| Negative | 2 years 1 month | 3 years 1 month | 3 years 10 months |
| Much improved | 1 year 10 months | 2 years 2 months | 2 years 8 months |
| Improved | 1 year | 1 year 6 months | 2 years |

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CHAPTER XIV

# TREATMENT OF LEPROSY—*continued*

## I Control of Treatment

One of the most difficult tasks of a physician in undertaking the management of a case of leprosy is to know when to withhold special remedies The question of the treatment of reaction will be considered later but what are the indications pointing to the necessity for stopping or reducing the dose of hydnocarpus oil or its derivatives ?

Generally speaking such questions only arise in lepromatous leprosy The great majority of neural cases are treated by intradermal injection of ethyl esters and seldom need the intensive treatment laid down for the lepromatous case The only indication which would point to the necessity for stopping intradermal injection in the neural case would be during the stages of reaction when the lesions are inflamed angry looking and scaling in such conditions intradermal injections will do more harm than good and in any case the patient s tissues are putting up an effective defence and there is no indication to give further treatment

In lepromatous leprosy however it is of utmost importance to watch for signs which indicate the necessity for reducing or withholding altogether injections of the hydnocarpus preparations

Some authorities consider that the sedimentation index test should be relied on to control treatment Our opinion however is that this is an unreliable test and should only be used in conjunction with clinical observations It is true that in cases in which caution has to be exercised this index is usually high but because it may not necessarily be so physicians are warned not to put too great a reliance on this test It can be stated however that a persistently high sedimentation rate indicates some activity either of leprosy or some concomitant condition and that if this is observed then caution must be exercised in pushing the injections

It is believed that more reliance can be placed on clinical methods for estimating the necessity for regulating treatment and the following clinical tests are of value in the control of treatment

1 Clinical condition of the patients
2 Multiple bacteriological examinations
3 Temperature

### 1 *Clinical Condition of the Patients*

The clinical observation of the patient is by far the most important single method of estimating whether the disease is increasing or whether treatment is lighting up activity When the patient is being examined prior to injections it cannot be too strongly emphasised that he should be seen in a good light and stripped to the waist In the case of women clothes should be so arranged that the patient can be examined adequately without embarrassment This is most important because one so often witnesses the spectacle of a large number of patients being injected without even the most cursory glance at the patient s clinical condition Once the eye is trained the

dose for children above seven should be 10 minims t d s remembering to start with one drop and gradually increase

When hydnocarpus oil is given by mouth it must be pure injection oil without creosote While no signs of intolerance have been definitely noticed by us when injections are given hydnocarpus oil by mouth may result in such signs and these are nausea possibly vomiting and diarrhoea On the appearance of such signs the oil must be stopped and recommenced at the lowest dose after all such signs have disappeared

Children of nine and above should be encouraged to take injections Because of the pain caused it probably is wise to commence with subcutaneous injections in children and then go on to the more painful intradermal injection The maximum dose should be reckoned at 1½ c c per every ten pounds of body weight Assuming a child weighs forty pounds then the maximum dose is 6 c c Subcutaneous injections are given starting at 1 c c and gradually increasing to 3 c c When this is reached intradermal injections are commenced the maximum dose of 3 c c of oil is maintained and the ethyl ester mixture started at 1 c c and gradually increased until 3 c c is reached Generally speaking because of the pain no child should be given more than 3 c c intradermally the balance should be given subcutaneously Except in dosage above 5 c c half the drug should be given by intradermal injection and half by the subcutaneous route

Because of the great tendency to natural arrest of the neural lesion only those cases with multiple lesions need receive intensive treatment The tuberculoid lesions in children unless extensive respond quite readily to intradermal injections With regard to continuing at school all non infective cases may remain in school provided they are examined every six months in the case of tuberculoid cases and three months in cases which show the incipient lesions of childhood or multiple hypopigmented lesion of simple macular leprosy In severe infection of nerves in children the great tendency to deformity must be borne in mind but this will be referred to in Chapter XV when the treatment of nerve lesions in leprosy is discussed

CHAPTER XIV

## TREATMENT OF LEPROSY—*continued*

### I Control of Treatment

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1 Clinical condition of the patients
2 Multiple bacteriological examinations
3 Temperature

#### 1 *Clinical Condition of the Patients*

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occurrence of fresh as well as the erythema and spread of existing lesions can be readily noticed If there is erythema or extension of existing lesions or fresh lesions then caution must be exercised in pushing treatment

2 *Multiple Bacteriological Examinations*

It is felt that this method gives a general indication of the progress or retrogression of the disease In the Lady Willingdon Leprosy Sanatorium all cases are divided into those who are re examined yearly six monthly and monthly While clinical improvement is frequently seen before bacteriological clinical deterioration is preceded by bacteriological deterioration Therefore if a patient s smears which have been showing gradual but slow improvement deteriorate then this is a warning sign for instance if the result of one examination is as follows

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| F H | Rt | 2+ | Ear Rt | 1+ | Chin | 2+ | Macules | 1 | — |
| | Lt | 1+ | Ear Lt | 2+ | Cheek | 2+ | | 2 | 3+ |
| | | | | | | | | 3 | — |
| | | | | | | | | 4 | — |
| | | | | | | | | 5 | 4+ |
| | | | | | | | Nasal | | 1+ |

And after three months the smear results deteriorate thus

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| F H | Rt | 4+ | Ear Rt | 3+ | Cheek | 4+ | Macules | 1 | 1+ |
| | Lt | 4+ | Ear Lt | 3+ | Chin | 4+ | | 2 | 4+ |
| | | | | | | | | 3 | 2+ |
| | | | | | | | | 4 | 1+ |
| | | | | | | | | 5 | 4+ |
| | | | | | | | Nasal | | 2+ |

This would indicate that there was a setback in the condition of the patient and that he needed careful observation More reliance is placed on multiple smears to indicate whether a patient s condition is deteriorating rather than improving for in the latter instance clinical signs precede bacteriological improvement Again if the bacteriological examination indicates that the patient is not improving then signs of reaction should be searched for and if found the case should be treated along the lines to be laid down If there is no temperature and there are no definite signs of reaction but smear examination shows deterioration in the results then it is wise to stop subcutaneous injections and continue intradermal injections until the next examination is due

3 *Temperature*

*The two previous methods of control* described are used as a guide to whether hydnocarpus remedies should be pushed and are in our opinion more trustworthy than the sedimentation index test We have seen at least one instance where the smear results indicated that caution should be exercised and yet the sedimentation index test was under ten and the patient *a few weeks later developed* acute lepra reaction

Probably one of the most reliable indices of the retrogression of the disease is seen in the temperature variations between the morning and the evening If it is possible

all patients should have their temperatures taken during the morning and in the evening between 3 and 5 p m If there are marked variations of the temperature whether there is actual fever or not caution should be exercised The average person has a regular variation between morning and evening temperatures and it is the disturbance of this that is a warning sign In large institutions the taking of four hourly temperatures is impracticable but if there are suspicions that the disease is increasing in any given case then the patient should be told to see that he gets his temperature taken between 3 p m and 5 p m in the evening Whenever the patient s temperature shows an evening rise above 99 F for more than two consecutive evenings treatment should be stopped until the temperature returns to normal for the same period

The decision as to the continuation of treatment or the withholding of treatment presents no difficulty when the patient shows progressive improvement or when there are obvious signs of deterioration The difficulty comes when consecutive smear results show no improvement or the results show a deterioration in the bacteriological condition In such cases our practice first is to note whether there is fever If there are slight evening rises of temperature then all subcutaneous injections are stopped and the patient is placed on intradermal injections alone reducing the dose to 0 5 c c ethyl esters mixture intradermally and this is slowly increased once a fortnight or once a month according to the severity of the signs until the temperature shows a rise as usually this occurs at 3 c c This we then consider the reaction level The patient is then given a rest until his temperature is normal for forty eight hours and the treatment is recommenced at 0 5 c c ethyl esters mixture and slowly increased and when 3 c c is reached subcutaneous injections are started increasing the dose by 0 5 c c every second week until 5 c c is reached The intradermal injections are then raised from 3 c c up to 5 c c In cases which tend to react it is probably best to give the subcutaneous and intradermal injections on separate days

If at any point the temperature rises then this is noted and injections are at once stopped and the patient rested until the temperature becomes normal and again intradermal injections are started slowly and increased until 3 c c is reached then subcutaneous injections are recommenced and gradually increased to 5 c c In this way the dosage is slowly worked up and if the patient is not in chronic reaction with caution the maximum dose of 15 c c a week can usually be reached

The general principle should be to stop subcutaneous rather than intradermal injections and work these up to 3 c c before subcutaneous injections are given Sometimes a patient will not tolerate subcutaneous injections then intradermal injections are cautiously increased to 5 c c and should be maintained for three months after which subcutaneous injections can be again started In this way not infrequently patients who cannot stand moderate dosages are able to reach higher doses and it is thought more effective dosage Low dosages should be continued so long as there are signs of intolerance to the remedy and often much patience must be exercised Sometimes the dose remains at 1 c c or lower for weeks and if the patient cannot reach the higher dose levels the result of treatment will almost certainly be very poor and the prognosis increasingly grave If such signs as iritis or inflammation of any elements of the eye set in during treatment then all injections should be stopped and treatment concentrated on the eye conditions the line of treatment for which will be indicated in the next chapter The same principle occurs in relation to severe nerve pain If an acute condition sets in in the course of leprosy then all measures should be taken

to alleviate this condition and special remedies only commenced again after the patient has returned to his normal state of health

### II Treatment of Reaction in Leprosy

In Chapter X two conditions have been discussed signs of activity in leprosy and reaction in leprosy which has been further divided into two subdivisions—reaction in neural leprosy and lepra reaction In the consideration of treatment of reaction this must be viewed in the light of these conditions In the previous paragraphs general *principles of treatment have been discussed and under this head the* management and control of active cases has been considered We now pass on to the treatment of reaction in leprosy and the subject is dealt with under the following heads

A *Reaction in neural cases*
B Reaction in lepromatous cases

#### (A) *Treatment of Reaction in Neural Cases*

This occurs in tuberculoid cases and may show itself in an acute exacerbation of tuberculoid leprosy or a simple macular case of neural leprosy may develop reaction which shows itself by a change in the clinical condition the lesions suddenly pass into a state of active tissue immunity the result of which is seen in the transformation into tuberculoid leprosy in the active reaction phase Apart from the occasional bouts of nerve pain and tenderness the pure neural case (neural anaesthetic) does not show any sign of reaction and the question of the treatment of neuritis in leprosy will be considered in a subsequent chapter

#### *Treatment of Reaction in Tuberculoid Leprosy*

This invariably is a manifestation of acute tissue immunity (? allergic) and the signs of this condition have been described When the reaction is mild it does not need special attention except that it must be remembered that intradermal remedies must be withheld so long as *the lesions are marked by erythema scaling or ulceration* Unfortunately this condition is sometimes associated with tingling and burning of the patches and continuous fever accompanied by nerve pain The burning and tingling of the body with acute tenderness of the patches is difficult to treat Anodynes such as aspirin caffeine and phenacetin should be tried and sodium salicylate with sodium bicarbonate should be given If sleeplessness is troublesome the following prescription may be found useful

| | | | |
|---|---|---|---|
| R | Aspirin | grs V | (0.3 grm) |
| | Codeine | gr ¼ | (0.016 grm) |
| | Phenacetin | grs V | (0.3 grm) |

This should be administered when the pain is severe and *the last thing at night* preceded by a dose of a sedative mixture such as

| | | | |
|---|---|---|---|
| R | Chloral hydrate | grs XV | (1.0 grm) |
| | Pot bromide | grs X | (0.6 grm) |
| | Sodium bromide | grs X | (0.6 grm) |
| | Aquam ad | ℥ ½ | (15.0 ml) |

When the pain and discomfort is not relieved by aspirin and phenacetin and is very distressing the following sometimes succeeds

| | | |
|---|---|---|
| ℞ Medinal | grs VII | (0 45 grm ) |
| Pyramidon | grs IV | (0 25 grm ) |

This is given last thing at night preceded by a bromide and chloral mixture If in spite



Fig 115 —S e e ulc t n and al g in the nt rm l t typ of l on wh t to k se en month t h l sympto mat t atm nt given No hydn arp s d t es injecte l

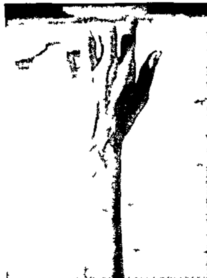


Fig 116 —S m han l sl ow ng ults of he l ng

of this the patient is sleepless then the following may be given at night and the medinal and pyramidon powders during the day

| | | |
|---|---|---|
| ℞ Chloral hydrate | grs XV | (1 0 grm ) |
| Pot bromide | grs XV | (1 0 grm ) |
| Tr opii | ♏ XV | (1 0 ml ) |
| Aquam ad | ℥ I | ( 0 0 ml ) |

One ounce is given at night and must not be given for more than three consecutive nights This remedy usually ensures at least three nights good sleep and the patient then will respond more readily to the less powerful drugs Occasionally when the condition is very distressing or in instances of severe pain when it is inadvisable to give morphia injections the following powder may be given with bromide at night

| | | |
|---|---|---|
| ℞ Pyramidon | grs IV | (0 2? grm ) |
| Medinal | grs VII | (0 4? grm ) |
| Heroin | gr 1/8 | (0 01 grm ) |

It should be remembered that such a powder must only be used when all else fails and not continuously When the skin is highly sensitive to the lightest touch especially

when there is scaling or ulceration of the lesions then the bed clothes should be supported on a cradle and prevented from contact with the acutely sensitive skin

When as sometimes is the case there is active ulceration and excessive crust formation the patient should be placed in a hot saline bath the crusts softened and then gently removed with olive oil or other bland oil No force must be used or there will be considerable bleeding The ulcerated areas are not bandaged but covered with plain hydnocarpus oil and the patient placed under a cradle If there is a great deal of crust formation which does not readily separate on soaking Lassar s paste will help in the separation of the scales especially on the arms and legs

| | | | | |
|---|---|---|---|---|
| R | Acid salicyl | ʒ | I | (4.0 grm) |
| | Zinc oxide | ʒ | II | (8.0 grm) |
| | Amylum | ʒ | II | (8.0 grm) |
| | Vaseline | ʒ | IV | (16.0 grm) |

This should be applied as a thick paste on gauze or lint and the limbs bandaged In a few days the crusts will separate and leave raw surfaces These should be dressed with plain hydnocarpus oil or the following ointment

*Chronic Ointment*

| | | | | |
|---|---|---|---|---|
| R | Acid boric | grs | XV | (1.0 grm) |
| | Ol eucalyptus | ♏ | XV | (1.0 ml) |
| | *Bis subnit* | ʒ | *I* | *(4.0 grm)* |
| | Zinc oxide | ʒ | III | (12.0 grm) |
| | Castor oil | ℥ | I | (30.0 ml) |

Instead of the above the following ointment as an alternative may be found more useful

| | | | | |
|---|---|---|---|---|
| R | Ol hydnocarpus | ʒ | III | (12.0 ml) |
| | Ol eucalyptus | ʒ | II | (8.0 ml) |
| | Zinc oxide | grs | LX | (4.0 grm) |
| | Dettol | ʒ | i | (2.0 ml) |
| | Vaseline | ℥ | I | (30.0 grm) |

If the ulcerated surface becomes secondarily infected and the fever is considered to be due to this then the sulphonamide products may be tried Not infrequently this condition in its more severe forms is associated with pyrexia and in such cases a course of mercurochrome is sometimes beneficial Five c c of a 1 per cent solution intravenously every third day may bring the temperature down six to eight injections should be given If the temperature returns to normal for forty eight hours the injections are stopped but if fever persists after six to eight injections there is no point in continuing the injections

The more severe conditions of reaction are usually seen in the atypical border line or intermediate cases and sometimes the reaction condition continues for six or seven months accompanied by much emaciation If the fever which is probably that of the hectic type continues for more than three months then the case is usually one belonging to the atypical group and this can usually be confirmed by biopsy and by the fact that the lepromin test is not infrequently negative

The management of such cases needs great patience care and nursing skill but they invariably recover leaving a considerable amount of deformity and scarring Once a diagnosis of acute reaction in tuberculoid leprosy or in the atypical form is made the patient should be encouraged by the fact that he will recover If such a

condition as described lasts more than seven months then one s diagnosis as to type must be seriously reconsidered for even the worst reactions in this type have shown recovery and healing within seven months It is most important to differentiate this condition from lepra reaction for its immediate prognosis is invariably good although deformity sometimes disabling deformity may result whereas as will be pointed out *the ultimate prognosis in lepra reaction is poor*

(B) *Reaction in lepromatous cases*

True lepra reaction as stated previously only occurs in lepromatous leprosy and may be acute sub acute or chronic Acute reaction may pass into the sub acute or

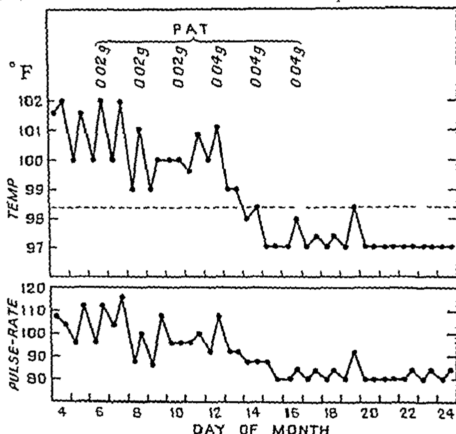



FIG. 11 —T[illegible] by [illegible] of P A T

chronic stages but the majority of acute reactions respond to treatment The sub acute and chronic stages are more insidious in their on et and more difficult to control

(a) *Treatment of Acute Lepra Reaction*

The symptoms and signs have already been de cribed but the warning must again be reiterated that a patient who has leprosy and becomes febrile may be suffering from

some complicating condition and all measures must be adopted to exclude such a possibility before special treatment for lepra reaction is commenced Therefore the first step in its treatment is to treat the patient along the usual lines of a non specific febrile condition

The patient is put to bed and given a powder containing aspirin grs 4 calomel grs 2 and Dover's powder grs 4 This is followed the next morning by a saline purge

It is remarkable how frequently fever drops after the bowels have been well opened

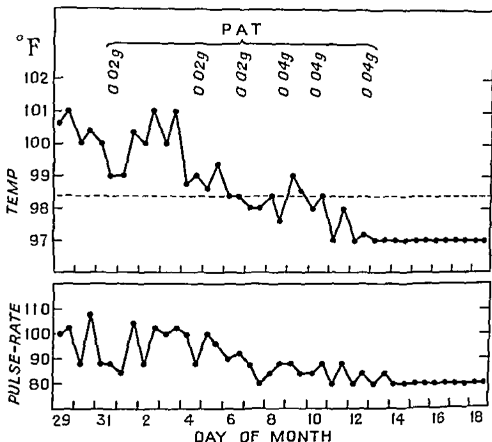



Fig 118 —Temperature chart illustrating the control of lepra reaction by intravenous injection of P A T

and the patient has perspired If the fever continues the patient is placed on an alkaline mixture containing sodium bicarbonate grs 30 to the ounce given every four hour Sodium salicylate is added to the mixture if the joint and bone pains are troublesome Mist alba is given every morning For pain a tablet of compral and if insomnia is troublesome a bromide mixture may be given If compral is too expensive a powder containing aspirin grs 4 phenacetin grs 4 and caffeine grs 2 may be prescribed This will frequently relieve pain and thus remove the greatest cause of sleeplessness If however the latter is troublesome codeine grs ¼ may replace caffeine and the powder given at night followed by a bromide mixture Proprietary remedies such as Codipyrin

or Vegamin will be found useful The diet should be light with plenty of fluids glucose being added if thought necessary

If the temperature does not come down within three or four days then one of the antimony products is indicated The one which has been in vogue is potassium antimony tartarate (P A T) but it needs special care in its administration owing to the fact that

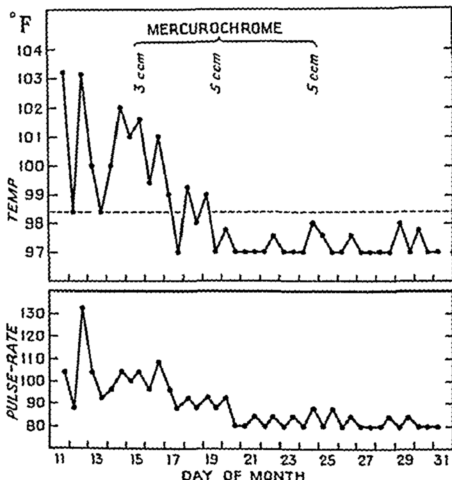



Fig 119—Temperature chart illustrating the control of fever by intravenous injection of mercurochrome in acute lepra reaction

it must be given intravenously and unless given carefully will produce sloughing of the tissues The dose is 0 02 grms in 2 c c saline intravenously every other day for three doses then 0 04 grms every other day for three doses Where it is difficult to administer remedies intravenously or in institutions where medical aid is not immediately available then the pentavalent preparation Fantorin (Glaxo & Co) may be given The dose is 2 c c intramuscularly every other day for six doses If the temperature does not respond and one still feels that the condition may be due to acute lepra reaction one is then justified

in giving a course of P A T i e 0 04 grms intravenously every other day for six doses Sometimes although we think rarely P A T acts when Fantorin fails If the temperature does not come down with Fantorin we believe that the diagnosis should be reconsidered this becomes all the more essential if P A T also fails to bring the temperature down In fact we teach that if the antimony products when properly used fail to bring the temperature down either the physician is not dealing with acute lepra reaction or it is complicated by some other condition

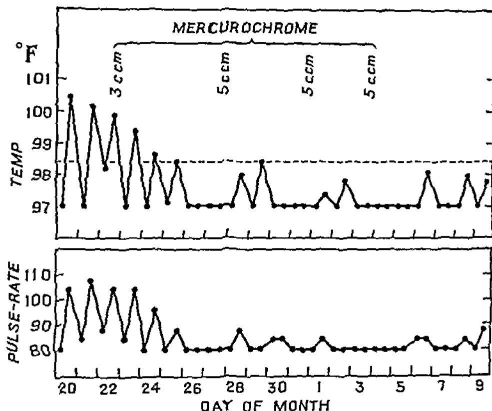



FIG 1?0 —Temp rature chart illust at ıg the control of fever by intravenous injection of mercuro hrome in sub acute lepra rea tion

(b) *Treatment of Sub acute Reaction*

As stated acute lepra reaction usually responds to treatment but when a patient suffers from a number of attacks the intervals between the attacks tend to become shorter and he is liable to pass into the sub acute stage The general lines of treatment are similar to those indicated for lepra reaction the distressing sequela of nerve pain will be considered later The fever in sub acute reaction is more difficult to deal with and the drug which has been found more generally useful is mercurochrome in a 1 per cent solution the dose is 5 c c for those above fifteen and 3 c c for children It is important to administer chemically pure mercurochrome for some commercial products are not for internal medication and if given cause serious febrile reactions Therefore mercurochrome for intravenous injections should always be ordered It is given intravenously every third

day Occasionally when mercurochrome fails then fluorescein may be tried this is given in a 2 per cent solution in 2 per cent sodium bicarbonate intravenously every third day Great caution must be used in the administration of fluorescein and it should be given in between meals and the patient kept in a room in a dull light and not exposed to direct rays of the sun for twenty four hours after the injection Not more than six injections should be given These measures not infrequently control the fever and with the general measures employed will bring the reaction stage to an end but in advanced

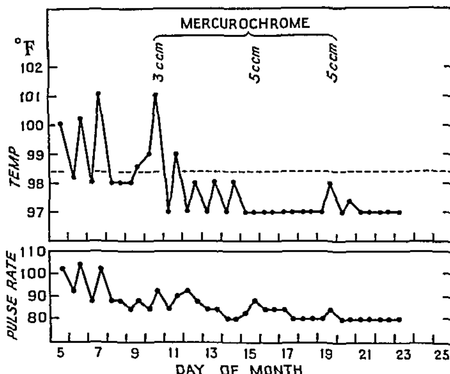



Fig 1 1—T mpe ture ch rt illu t t ng th c nt ol of f by intra nous inj t n of m u ochrom n at a ute l p a re t on

lepromatous cases this usually is only temporary to be followed in another few weeks or even days by a fre h ri e of temperature and a gradual development of chronic reaction

(c) *Treatment of Chronic Reaction*

This can be considered under general treatment and treatment of special complications e g breakdown of nodules giving ri e to ulceration The general treatment is mainly symptomatic and pre criptions and guidance have already been laid down with reference to thi If the fever does not subside after the admini tration of the various remedies advi ed in acute or sub acute reactions then there is little value in pres ing the treatment and the condition must be treated symptomatically until the temperature comes down This condition in such in tances may continue for many months and the

patient pass into a weakened cachectic condition and die as a result of the prolonged reaction or fall prey to one or other of the more serious complicating conditions e g dysentery tuberculosis nephritis

As a result of the almost continuous bouts of fever patients may become anaemic and this should be combated by adequate doses of iron vitamin B complex may be given either as yeast (ii drms four to six times a day) or if the person can afford it one of the reputable preparations of concentrated vitamin tablets which are on the market If Marmite is used adequate doses (½ to 1 oz ) should be given

In the stage of chronic reaction nodules tend to break down and ulcerate If the ulcers are dirty then they should be cleaned with eusol dressings or with saturated mag sulph compresses followed by eusol dressings When the discharge has diminished and the ulcers are clean one of the two ointments recommended or the following may be given

| | | | |
|---|---|---|---|
| R | Ol eucalyptus | ʒ IV | (15 0 ml ) |
| | Honey | ℥ ii | (56 7 grm ) |
| | Cod liver oil | ℥ ii | (56 7 grm ) |
| | Zinc oxide | ℥ i | (28 4 grm ) |
| | Bis subnit | ℥ ii | (56 7 grm ) |
| | Vaseline | ℥ iii | (85 1 grm ) |

If the nodules have not ulcerated then frequent application of a carbon dioxide snow will be found useful This must be applied with firm pressure from forty seconds to one minute according to the consistency of the nodule The more fibrous ones may need the longer time Under constant application a crust forms over the nodule which ultimately separates and the nodule frequently then dries up and gradually disappears Applications should generally not be repeated until crusts have separated

The one remedy which seems of value in chronic reaction with breaking down and ulcerating nodules is the salts of gold Solganol B oleosum has been recommended but Myocrisin oily (M & B ) may be used instead In all such cases where other remedies have failed a course of gold may produce healing of the ulcers The points to remember are (1) that the dosages must be low (2) a second course should not be given in less than three months (3) the drug is given intramuscularly once a week in the following dosages

Three injections of 0 01 grm
Three injections of 0 05 grm
One injection of 0 10 grm

The treatment of chronic reaction is not satisfactory but one usually can make the patient s life at least bearable and tide over the more distressing symptoms for a considerable period but it must be borne in mind that this condition presents the most acute nursing problems and all the care patience and fortitude of the medical staff are needed to maintain the morale of the patient when he gets to this condition The newer drugs such as promin diasone promizole appear to be encouraging when used in this condition but these are still in the experimental stage and must be given over a long period

CHAPTER XV

# TREATMENT OF NEURITIS IN LEPROSY

NEURITIS in leprosy is usually a reaction condition but has not been described under lepra reaction because its relief is of such importance in maintaining the well being of the patient that special consideration must be given to the management of a case complicated by neuritis In the chapter on Pathology it was pointed out that nerve tissue reacts defensively to the attack by M leprae in two different ways In one form there is a violent tissue response as seen in tuberculoid leprosy in the other there is an interstitial fibrosis which results in fibrous tissue formation which contracts and ultimately strangulates the nerve fibres The ineffectiveness of certain treatments in leprosy complicated by neuritis we feel has been because the physician has not always realised the essential difference in the pathology of these two types of neural lesions

## Neuritis due to Active Tissue Immunity

This type of case is always seen in tuberculoid leprosy and more rarely in some of the atypical lesions As has been described granulomatous masses form actually in the nerve tissue which is invaded by round cells epithelioid cells and giant cells Owing to the pressure of the granuloma on the nerve sheath abscess formation is likely to occur if the condition is not relieved Neuritis in tuberculoid leprosy and to a less extent in the atypical forms shows itself in two ways

(a) Acute (b) Chronic

### (a) *Acute Neuritis*

This invariably occurs in the reacting case and all signs of active tissue defence as described in the previous chapter are present The affected nerves are swollen grossly enlarged and acutely tender Not infrequently there are signs of abscess formation The swelling of the nerve may not be uniform It is a safe assumption to conclude that in all cases which present signs of marked tissue immunity in the skin when they manifest symptoms of reaction in the nerves that the reaction is of the same nature The only method of treatment in these cases is operative and the longer this is delayed the more likely are abscesses to form and secondary fibrosis result Therefore the earlier the operation is undertaken the better the result The object of the operation is to dissect away the constricting outer nerve sheath and so allow for the free expansion of the inflammatory exudate and thus relieve the pressure and if the operation is undertaken in the early stage there is little likelihood of secondary fibrosis when the tuberculoid condition subsides there is a fair chance of regeneration of the nerve fibres and recovery of function In one case in our experience the whole of the ulnar nerve was scraped away but after six months of massage and passive treatment complete restoration of function was achieved

Where a diagnosis of acute tuberculoid reaction in a nerve is made especially

when it involves the ulnar nerve operative procedures must be undertaken without delay Several operative procedures have been advocated

(1) Nerve stretching
(2) Incision of sheath and stretching of nerve
(3) Excision of the sheath over the whole length of the affected portion

Nerve stretching by itself is not to be recommended and is a useless procedure The second procedure is not sufficiently radical and therefore the third method advocated by Lowe and the Calcutta School is the method of choice

*Description of Operation* This is usually only indicated in acute tuberculoid reaction in the ulnar nerve It must be borne in mind contrary to the generally accepted opinion that the ulnar nerve is affected chiefly in the middle two thirds of its length *and not at the bend of the elbow* Because it is impossible adequately to anaesthetise an inflamed nerve a general anaesthetic should be given A tourniquet may be used for the initial step for the removal of the nerve sheath can then be effected without the operation field being obscured by blood A tourniquet is not absolutely essential but is *more convenient for the oozing from small vessels may be troublesome and unless* haemostasis is effective the operation is more difficult We have seen no untoward result from the application of a tourniquet The nerve is exposed for four to six inches at its points of greatest thickness—in the centre of the arm and not at the elbow—as *it passes on the inner side of the artery on the intramuscular septum The nerve is* freed from its bed and the sheath incised along the whole length of the exposed nerve an aneurysm needle is passed round the sheath behind the nerve and the whole sheath freed at the same time stretching the nerve The sheath then is completely removed by cutting it away with a pair of fine scissors If an abscess is discovered the procedure is the same but the abscess is carefully scraped If a tourniquet has been applied it is now loosened bleeding points caught and the nerve replaced in its original position and the wound sutured without drainage The relief is immediate and there are seldom operative complications unless an abscess has not been thoroughly dealt with or the nerve sheath not completely removed when the wound will not heal owing to fresh abscess formation then the wound must be reopened and a more thorough removal of the nerve sheath with evacuation of the abscess completed After treatment in the way of exercise and massage will be described under the treatment for other forms of neuritis Generally speaking operative procedure is only of value in the case of the ulnar nerve and while it will relieve pain it seldom prevents the onset of or recovery from drop foot If the great auricular nerve is grossly involved as this is solely a cutaneous nerve of minor importance the whole length of it from its appearance at the sterno mastoid muscle to the auricle can be excised Care must be taken thoroughly to excise *the whole length* of nerve for unless it is efficiently done an abscess at the edge of the muscle will result The operation cures the pain and removes an unsightly nerve Enlargement and abscess formation of superficial cutaneous nerves are of little importance If these are painful and unsightly the whole of the grossly swollen portion *may be excised In cases of motor and* cutaneous nerves combined complete excision of the nerve must never be undertaken

(b) *Chronic Neuritis*

If neuritis in tuberculoid leprosy is not adequately *treated a nerve* abscess may ultimately break down through the skin and result in a sinus This sinus will continue

until the necrotic material has been completely extruded or until an operation has been undertaken to deal with the abscess along the lines already indicated If however such a condition is allowed to arise the chances of permanent damage are considerable for secondary fibrosis is likely to set in It is therefore better at any stage to scrape the abscess and remove the sheath even though this means complete loss of function for when the necrotic material has been evacuated and only a few fibrous strands remain after the operation yet I have seen regeneration of the nerve and recovery of function

In neural anaesthetic leprosy the tissue reaction is one of interstitial fibrosis This results as explained in the destruction of the bacilli and ultimate strangulation of the nerve fibres and loss of function The treatment of this condition is similar to that which is about to be described under neuritis in lepromatous leprosy

**Neuritis in Lepromatous Leprosy**

Neural anaesthetic leprosy is the only type of leprosy in which nerve tissue alone is affected In all other forms of leprosy there are cutaneous lesions as well as neural hence the old term cutaneous or skin leprosy gives an entirely wrong conception of what is known as lepromatous leprosy Similarly while lepromatous leprosy does not necessarily show neural signs yet nerves are affected If for instance the ulnar or peroneal nerve is examined and smears taken from the nerve sheath M leprae can be discovered almost invariably In sections if the correct technique is used for staining for acid fast bacilli bacilli can be demonstrated in the nerve As has been mentioned even though bacilli can be demonstrated in the nerve sheath no tissue reaction is noticed hence the nerves usually stand out clearly in the corium in sections from lepromatous leprosy the changes noted may be a slight proliferation of the perineurium and some swelling and oedema of the individual nerve bundles While this applies to early leproma as the condition advances the bacilli lying between the individual nerve bundles act as foreign bodies and an interstitial fibrosis which in contrast to that of neural anaesthetic leprosy sets in slowly but nevertheless the end result is the same namely destruction of the nerve and complete loss of function Neuritis in lepromatous leprosy which is always of the nature of an interstitial fibrosis is seen in three forms

(*a*) Acute (*b*) Sub acute (*c*) Chronic

Before describing the above three conditions it might be well to mention that in all forms of interstitial fibrosis operation is contra indicated for unlike neuritis in tuberculoid leprosy where the granulation tissue is within the nerve pressing on the sheath from within there is no granulation tissue within the nerve but a fibrosis between the individual nerve bundles and hence any operative interference will only tend to increase the fibrosis and the last stage is liable to be worse than the first

(a) *Acute Neuritis*

This is chiefly seen in lepromatous leprosy but may occur in the simple macular or neural anaesthetic case The onset is sudden it may be precipitated by injudicious use of remedies e g iodides and the following signs and symptoms are prominent There is oedema and tenderness of the nerve without actual abscess formation the nerve is usually thickened swollen and oedematous and very tender to the touch It is in just this type of case that great gentleness needs to be observed in examination and palpation of the nerve for much pain can be caused by forgetting that nerves in lepromatous

leprosy can be enlarged and tender It is to be remembered that in neural anaesthetic leprosy the same type of lesion may be present for the main brunt of the attack is on the large nerves and these may *become swollen tender and* even oedematous with all the signs of an acute condition Although neuritis in neural anaesthetic leprosy is more likely to be sub acute and chronic acute neuritis in lepromatous leprosy or more rarely in the neural anaesthetic or simple macular type may cause great pain and the symptoms are sometimes so acute that the condition demands measures for immediate relief The pain frequently is so severe and the remedies recommended for other types of neuritis take so long to bring relief that the patient s acute distress must be relieved Three procedures may then be adopted

1 Alcohol injections into the nerve sheath
2 Deep X ray treatment
3 Administration of adrenalin or ephedrine

1 *Alcohol Injections into the Nerve sheath* In the first type when the nerve sheath is oedematous and swollen and the case is one of lepromatous leprosy where there is no danger of abscess formation an injection of alcohol into the nerve sometimes produces *lasting relief* It will always bring immediate if temporary relief and is worthy of a trial The technique is as follows using a 2 c c syringe with a small needle (size 18) palpate the enlarged nerve and then run the needle of the syringe along the palpating index finger and as soon as the nerve is felt under the needle give a sharp poke and enter the nerve sheath ♏ 3–5 of a 75 per cent solution of alcohol is injected directly into the nerve sheath The pain momentarily is excruciating but the relief if the injection is given properly is instantaneous If it is impossible to penetrate the nerve sheath a little novocaine (2 per cent ) may be injected around the nerve and then without withdrawing the needle recharge the syringe with alcohol and inject this around the nerve This method is less effective but gives temporary relief and certainly reduces the pain considerably

2 *Deep X ray Treatment Some years ago Espen (1940)* advocated *deep* X ray exposures for acute neuritis and in the stage of oedema where fibrotic tissue formation is not marked dramatic results have been noted Four to six exposures are usually necessary and if no relief is noted at the end of this period deep X ray should be abandoned In all cases of acute neuritis in the course of lepromatous leprosy especially if associated with fever a course of potassium antimony tartrate (P A T ) along with general measures for the relief of nerve pain is worthy of consideration for when lepra reaction subsides the neuritis frequently is greatly relieved

3 *Ephedrine or Adrenalin* Injections of adrenalin ♏ 10 in ♏ 30 saline have been advocated for painful neuritis These sometimes help and should either be given sub cutaneously or along the course of the nerve Ephedrine has been recommended in place of adrenalin but is not so effective and it is doubtful whether it is of much value by mouth Whenever there is acute pain local applications e g icthyol and glycerine or antiphlogistine are of value and the limb should be splinted The patient frequently needs to be put in bed and the preliminary treatment indicated for lepra reaction should be given *It has not infrequently been noted that acute reaction* in lepromatous cases is accompanied by nerve pain this sometimes is relieved by P A T and therefore should be given when the symptoms suggest a diagnosis of acute lepra reaction Diathermy has been found useful and is worth a trial

(b) *Sub acute Neuritis*

This complication is usually seen in the form of a multiple neuritis The pain is not so severe as in acute neuritis but the patient is conscious of pain and any manipulation of the nerve causes distress as the nerve is tender The remedies described for acute neuritis may be tried the patient's general condition should be treated and such irregularities as constipation dealt with It is in this condition and in the chronic condition that dietetic treatment seems of more value the diet advocated is a whole wheat diet and the method adopted is described below

(c) *Chronic Neuritis*

This is the final result of the interstitial fibrosis seen sometimes in neural but more often in advanced lepromatous leprosy This is a distressing condition for the patient is always conscious of pain and frequently associated with this condition is found severe bone pain This is elicited by pinching the clavicles or lightly pressing the anterior surfaces of the tibia or the radius and ulna As this is a chronic process some of the remedies described for the relief of the more acute conditions are of little avail Anodynes such as phenacetin caffeine and aspirin are given If these fail and the pain is very severe the powder containing pyramidon and medinal may be prescribed Combined with such a measure local applications such as antiphlogistine or ichthyol and glycerine may be tried and the arm put in a sling or splinted Opium or morphia should never be administered either by mouth or in the form of an injection except occasionally in the form of a hypnotic if the patient has had many sleepless nights then one dose of the bromide chloral tr opii mixture may be given at night to ensure sleep On no account must injections of morphia or heroin be prescribed because this condition is chronic and a morphia habit is in danger of being acquired if injections are ordered The bowels are kept open by saline or other suitable purges and if there is evidence of lepra reaction this is dealt with in the manner previously described Where the pain is severe none of these methods are of any permanent value It has been found that this condition may respond sometimes dramatically to a whole wheat diet Results cannot be expected immediately but within three months in a series of cases 85 per cent had complete relief of bone pain and 69 5 per cent of nerve pain the rest had partial relief The total number of cases was fifty seven The method of administration is as follows

All rice is eliminated from the standard diets of the Sanatorium and instead whole wheat was taken This was lightly ground on the curry stone and cooked in the same way as rice and distributed to the patients who ate it along with their usual curries In the evening chapatties[1] were eaten For adults 21 oz of wheat per diem were supplied and for boys 12 oz Wheat prepared in this way needs slightly longer cooking than rice and extra salt should be added

From time to time other methods of relief of nerve pain have been advocated Gass (1938) tried cobra venom and claimed a 75 per cent relief of pain and said that it had given far better results than anything else The recommended dosage was as follows first day 0 1 c c third day 0 2 c c fifth day 0 3 c c increasing thus until a dose of 1 c c is reached We failed to confirm that this remedy was of real value

[1] A chapatti is a type of p n k made with wh t flo and te  w d ly o er Ind  especially in the no th

but possibly it is of most benefit in the arrested case where the chief symptom is intense burning and pricking pain

Diphtheria formal toxoid 0 5 c c to 2 c c once a fortnight has been advocated but this method is not recommended for it gives little or no relief and is liable to set up reactions in lepromatous cases Intradermal injections along the course of the nerve have been advocated by Chaterjee but we have never experienced any appreciable relief by this method and fail to see the reason for recommending this procedure For the associated bone pain deep X rays have been tried with some success but it will not appreciably affect the chronic nerve pain for this is only of value in the swollen and tender painful phase It should be remembered that in every case of neuritis in leprosy the patient should be warned of the possibility of deformity This is especially necessary in the chronic interstitial variety Nevertheless even when deformity has set in much alleviation can be obtained by appropriate treatment Muscular atrophy in leprosy is due to two factors (1) loss of function as a result of damage to the nerve supply to the muscle (2) disuse atrophy While the former is difficult to prevent the latter need not occur In all cases after the acute condition has passed massage and appropriate active and passive exercises should be prescribed In addition electrical stimulation of the muscles should be undertaken This is best done by the faradic current but the toy hand battery in which the current is generated through an electric magnet by turning a handle should not be despised If a patient is willing to spend the time taken to massage his hands exercise his affected muscle and persistently apply some kind of electrical stimulus to the limb much deformity can be prevented and disuse atrophy and the worst effects of claw hand avoided Drop foot and facial paralysis very seldom recover even with the most vigorous measures All cases of neuritis in leprosy of the interstitial variety should be placed on a whole wheat diet While injections or tablets of Berin or other vitamin $B_1$ preparations may be prescribed we have never been convinced of their usefulness and consider that the whole B complex should be advised rather than one of its several components

In conclusion it may be said that much can be done for nerve pain in leprosy and it is our confident hope that by far the great majority of patients complaining of nerve pain will be helped by one or other of the methods which have been outlined even though complete relief is not always possible of achievement in every case

## Physiotherapy Actinotherapy and Electrotherapy in Leprosy[1]

In all general hospitals electrical treatments and massage are considered as essential measures in dealing with the results of nerve lesions yet the number of hospitals or sanatoria dealing with leprosy which can boast of a department devoted to work of this kind is comparatively small despite the prevalence of neural involvement in leprosy

It is not our purpose to deal with technical details on a subject of such magnitude but to concentrate on practical issues and so it may be worth while to begin with a brief description of the various types of treatment which should be undertaken in the electrical department of a leprosy institution and then give an account of the application of the treatments to leprosy lesions

[1] Dr Donald Dow lately Superintendent of the Leprosy Hospital Dichpali Nizam's Dominions has kindly contributed the following account of simple physiotherapeutic methods which he has found of value in the treatment of nerve lesions in leprosy

*Electricity*

The following are the procedures in common use

*Diathermy* This is a high frequency alternating current with oscillations too rapid to allow of chemical changes in the conductor through which it passes so a great thermal effect can be produced The current flows chiefly round a limb to which the electrodes have been applied in the plane of the subcutaneous or deep fascia and little passes directly through the muscles in a direct line from one electrode to the other Short wave therapy on the other hand produces heat in the depth of the tissues This is a high frequency current with oscillations of 10 to 100 million cycles per second

*Galvanism* This is a constant current which is used along with the faradic current in the testing of muscles and nerves It stimulates muscles into contraction at the moment of making and breaking of the circuit of the current It also increases cell activity in the tissues through which it passes

*Faradism* This is an alternating current with power to stimulate nerve fibre

*Sinusoidal current* is an alternating current with the current rising from zero to maximum then falling to zero to be followed by the same process but with the current flowing in the opposite direction

*Light*

There is no need for an elaborate description of the various types of lamps for the production of ultra violet or infra red light

Ultra violet light is used for its general tonic action and confers increased resistance to infectious ailments It is supposed to produce vitamin A in the deeper layers of the skin

Infra red light is one of the commonly used sources of dry heat which produces vasodilatation of the surface vessels leading to an increased flow of arterial blood

*Massage*

The manipulations chiefly used are

(*a*) Effleurage—a stroking movement
(*b*) Petrissage—the muscles are drawn away from the bone and squeezed
(*c*) Kneadings—the muscles are moved in a circular manner by the hand of the operator
(*d*) Vibrations—a sensation of vibration is transmitted through the hand of the operator to the patient
(*e*) Frictions—small circular movements usually given around joints or along the course of nerves
(*f*) Tapotement—percussive movements

In all the manipulations pressure is always given in a centripetal direction thus greatly improving circulation assisting in the absorption of inflammatory exudates maintaining muscle tone and preventing adhesions

Active passive and resistive movements are performed to increase mobility and strengthen muscles Patients should be encouraged to perform simple exercises to strengthen or re educate muscles

*X rays*

A small X ray plant is very useful for the detection of bone lesions

**Treatment of Lesions**

Nerve involvement with its attendant pain or deformity *is extremely common in* leprosy and consequently cases of that type form the bulk of the patients in the electrical department

*Unless in acute cases where the relief* of symptoms is urgent it is advisable to test the electrical reactions of the muscles Normal muscles react briskly to the faradic current through stimulation of the nerve fibres The galvanic current causes direct stimulation of the muscles the response taking place at the make and break but the contraction around the cathode is greater than that at the anode i e K C C > A C C In muscles to which the nerve supply has been cut off by disease there is *no response* to stimulation by faradism and the response to galvanism is weak and torpid but persists while any muscle cells exist The making of the current however produces a greater *effect than the breaking i e A C C > K C C* These phenomena constitute the reaction of degeneration and are a sign of complete nerve destruction It follows therefore that treatment cannot produce benefit in lesions due to destruction of nerves in leprosy when muscle testing reveals reactive degeneration

It is in the treatment of pain due to swelling and tenderness in the larger nerves (ulnar peroneal etc ) that electrical treatment is of most value

Routine treatment should be given daily and consist of

(*a*) Fifteen minutes massage to affected limb
(*b*) Fifteen minutes interrupted galvano faradism in the form of electric bath
(*c*) Twenty minutes hydro diathermy—about 125 amp of current
(*d*) Simple exercises to encourage use of affected muscles

This treatment is generally beneficial in cases with tender nerves whether they can be classified as neural or lepromatous and the best results are naturally to be expected where the condition is not of long standing In neural cases when there is no reaction of degeneration and where the muscle tissue has not been replaced by fibrous tissue there is often marked improvement in deformity and sensation It is advisable to give hydro diathermy rather than direct application of electrodes in these cases unless expert observation is available all the time for the great danger is burns *on anaesthetic areas*

For acute pain whether the nerves are thickened or not we have not found diathermy of great benefit till the acute phase has subsided Exposure of the tender *area to infra* red light seems to bring relief in these cases and when *the acute pain has* subsided diathermy with massage is indicated followed later by electrical treatment This holds true of the very tender nerves in lepra reaction and also in those found in the reactive phase of tuberculoid leprosy though in some of these we have found that after exposure to infra red light operation was necessary and after the wound had healed *treatment* was continued with diathermy massage and finally electricity

In cases of chronic nerve pain when the response to other forms of treatment has not resulted in benefit the sinusoidal current is often successful and should always be tried for the low grade pain *attendant on chronic nerve involvement* often makes the patient feel very miserable In old standing cases with marked muscle wasting as a result of nerve destruction little benefit can be expected from electricity

The use of ultra violet light has no special place in *the treatment of leprosy* It

has no effect on skin lesions generally and in some cases of lepra reaction seems to aggravate cutaneous lesions

Infra red radiations on the other hand are a very valuable aid in several conditions e g

*Trophic Ulcers* Where conservative treatment has been decided on 20–30 minutes exposure to infra red light often produces very pleasing results when other types of treatment have failed

*Local reactions following injections* Many of these cases go on to abscess formation but if treated in the early stages with infra red light the swelling subsides and operative measures are unnecessary

*Neuritis* In acute cases before it is advisable to give diathermy and electrical treatment infra red radiation should be given and is very comforting to the patient

The one great use for X rays in leprosy is for the examination of bone conditions The rarefaction and absorption of bones can be demonstrated and it is also valuable to find out in cases of trophic ulceration with mixed infection if there is necrosis of underlying bone before deciding on the extent of operative interference required

# TREATMENT OF EYE NOSE AND THROAT LESIONS

## A TREATMENT OF LESIONS OF THE EYE

The danger of leprosy of the eye has been stressed already and therefore it cannot be too strongly emphasised that any affection of the eye due to leprosy must be taken seriously and treated adequately The lesions of the eye have been divided into those resulting from actual invasion by M leprae and those due to mechanical causes through damage to the nerve supply

### Treatment of Eye Lesions in Neural Leprosy

*The first principle is to protect the eye* this is best done by putting liquid paraffin or castor oil drops in the eye especially at nights If there is an associated conjunctivitis *the eye should be cleaned before the drops are inserted by washing with the following* lotion

| | | |
|---|---|---|
| Boric acid | grs X | (0 6 grm ) |
| Zinc sulphate | grs ½ | (0 03 grm ) |
| Aquam ad | ℥ I | (30 0 ml ) |

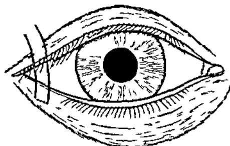
If there is paralysis resulting in lagophthalmos and the cornea is exposed when the eyes are closed then the operation of tarsorrhaphy should be done

There are two methods of operation both involve creating raw surfaces on the upper and lower lids and approximating these surfaces *The first* method has been described by Cass as follows

*Iodine is painted over the skin surface of the lower lid which is to be excised and* then the eye is washed thoroughly with 1 5 000 corrosive sublimate solution Two drops of 4 per cent cocaine solution are instilled in the eye three times at five minute intervals One per cent novocaine solution is used as infiltration anaesthesia for the skin and subconjunctival surface and a few drops of 1 1 000 adrenalin are added to the novocaine solution to control excessive bleeding The upper lid is everted and novocaine solution injected into the portion of conjunctiva to be excised an amount sufficient to produce moderate ballooning of the tissue is used The skin area of the lower lid is dealt with in a similar fashion

*Operation* Before beginning the operation it is advisable to determine where the new lateral canthus is to be This point is marked on the upper and lower lids The upper lid is now everted and an incision 5 mm deep is made along the intermarginal line and carried out to the lateral canthus Then an incision sufficiently deep to excise the conjunctiva is carried upwards *for about 5 mm* after which it is carried out to the lateral canthus—the incision being in the form of a triangle with its base towards the medial parts of the eye and its apex at the lateral canthus A similar incision is made over the skin of the lower lid as shown in the diagram It is very important at this *time to remove* the lash bearing area of the lower lid which is to be included in the suture If this procedure is not thorough the result is that lashes grow again with much

discomfort to the patient The union of the two corresponding raw surfaces is merely the matter of a mattress suture The suture material which we use is silk The suture should be armed with two fine eye needles with a full curve The first needle with suture is passed from the under or conjunctival surface of the lower lid and out through the excised area of skin then through the raw or undersurface of the upper lid to the outside This procedure is repeated with the needle at the other end of the suture at a distance of about 4 mm from the point of entry of the first needle The procedure is illustrated in the accompanying diagram



It is wise to tie the two ends of the mattress stitch over a small ball of cotton so as to avoid cutting into the skin A short continuous stitch may be taken to approximate the margins of the lids This is however not necessary if there is proper approximation with the mattress stitch The eye or eyes should be kept bandaged for about ten days The mattress stitch is usually removed on the twelfth day The eye may be washed with weak antiseptic solutions after the fourth or fifth day Of course the less meddling there is after the operation the less danger there is of non union of the two surfaces When dressings are changed it is important to avoid any pulling or tugging Before removing the eye pad it should be thoroughly soaked with warm sterile boric lotion

The cosmetic result of the operation is better if a bilateral canthorrhaphy is done It is however not always necessary to do both sides

The second method advocated by Kambo adopts the same principle except that a triangular piece of mucous membrane is removed from each lid and with it the lash bearing areas and the raw surfaces approximated as follows

The stitches are inserted in such a way that four small pieces of rubber are brought in apposition to the stitches so that slight pressure is maintained A piece of rubber about 2 mm diameter is threaded on a needle with the suture stitches the needle is passed through the lower lid from without in and through the upper lid from within out leaving the rubber against the lower lid When the needle is passed through the upper lid another similar piece of rubber is threaded The needle then is taken through the upper lid as a mattress suture but before it is passed for a second time through the raw surface this time from without in a third piece of rubber is threaded in a similar way and then the needle passes through the upper lid and then through the lower this time from within out and finally the fourth piece of rubber is fixed in the same way the suture is firmly but not tightly tied No bandage is needed but the eye should be washed daily and inspected to see that the rubber is not pressing on the lid if this is so it is easy to remove one or more pieces of rubber and at the end of the fourteen days

the stitches are taken out If lagophthalmos has been present for a considerable time not infrequently as a result of the irritation a small corneal ulcer develops This may remain unnoticed because of the absence of pain and should be carefully looked for in all cases of paralysis due to neural leprosy Sometimes the ulcer is not noticed until the inflammation has subsided and then a small ulcer is noticed on the cornea Treatment should be instituted at once lest complications arise but these are not so common as ulcers resulting from acute iritis due to the M lepræ The only method advised is cauterisation of the ulcer and this should be done as follows

Place the patient in a good light and on a table Cocainise the eye well then insert a speculum in order to control the eye one drop of fluorescein having been previously placed in the eye and the conjunctiva and especially the fornices well dried Then dip a pointed match stick in carbolic and touch the edge of the ulcer all round and in the centre Wherever the carbolic touches an opacity forms care must therefore be taken but over precaution will result in the process having to be repeated therefore be careful but do not be over cautious Wash the eye out with saline and do not bandage After treatment consists of atropine drops and saline washes until the ulcer is healed and all inflammation has subsided

***Treatment of Lepromatous Lesions of the Eye***

In Chapter XI it has been pointed out that any or all of the elements of the eye may be involved in the lepromatous process either by direct spread from the skin or through the nasolachrymal duct or by the blood stream In the description of the treatment of the eye in lepromatous leprosy we shall consider the involvement of each structure in turn

## A The Sclera

(a) *Diffuse Episcleritis*

It has been pointed out that this can be acute or chronic in the former the conjunctiva is always involved and there is therefore an associated conjunctivitis Treatment consists of irrigating the eye with saline and applying the following ointment

| | |
|---|---|
| Sulphapyridine | grs IX (0 55 grm ) |
| Vaseline ad | ℥ 1 (30 0 grm ) |

The ointment is continued for four days after which the eye is washed out with saline and a 25 per cent adrenalin solution instilled every four hours If there is pain and lachrymation then dark glasses or eye shades are advised and a line of treatment adopted which is similar to that for iritis

(b) *Chronic Diffuse Episcleritis*

The eye is washed out with saline and it will be sometimes found that trypan blue injected sub conjunctivally twice a day may be of value The method is described under sub acute iritis The injection is repeated when the discolouration is almost gone this takes about three weeks If the cornea is invaded by the lepromatous granulomatous tissue extending from the sclera then it is advisable to make an incision completely around the perimeter of the eye this is best done with a pair of straight iris scissors and the incision is taken down to Decemet s membrane There is some

evidence that leproma will not invade the scar tissue thus produced The operation must however be done early and is indicated whenever the whole circumference of the cornea sclerotic junction is involved A diffuse scleritis will occasionally clear up as the leprosy improves and is a condition which of itself is not serious it becomes serious when it extends and the process invades the cornea or when complications—e g iritis—set in

In circumscribed lepromatous lesions of the sclera a nodule gradually develops often situated at the limbus this should be excised under local anaesthesia and the base well cauterised The operation is very satisfactory when the nodule is hard and fibrous but when soft the nodule is not so easily removed the edges not so defined and there is a greater tendency for the process to become diffuse

## B Iritis

This is divided into

(a) Acute iritis (b) Sub acute iritis (c) Chronic iritis

(a) *Treatment of Acute Iritis*

These cases should be treated along the same lines as acute lepra reaction as far as the general treatment is concerned That is they should be put to bed given calomel at night and mag sulph in the morning Then anodynes such as indicated in the chapter on Reaction in Leprosy should be prescribed For pain in the eye compral appears to be most effective followed by a bromide mixture at night Measures to reduce pain should include hot compresses of saturated mag sulph occasionally cold compresses act better Leeches sometimes are of great value and should be applied to the temple The leech is placed in a test tube the temple area scarified in order to draw blood or a drop of milk placed on the temple the test tube is placed against the area and withdrawn when the leech has taken a firm hold The most important measure in the treatment of *iritis is to endeavour to* produce maximum dilatation of the pupil in the minimum time remembering that it is not easy to dilate a pupil when the iris is inflamed Atropine 1 per cent should be instilled every three hours or if that is not sufficient atropine combined with scopolamine Do not forget to exercise firm pressure on the nasolachrymal duct to prevent excessive absorption of atropine and unpleasant symptoms arising such as dryness of mucous membranes and giddiness Once full dilatation of the pupil has been achieved the drops can be replaced by atropine ointment (1 per cent ) The eyes *should be* cleansed with saline before drops are put in Dark glasses or an eye shade should always be used for there is usually intense photophobia but bandaging the eyes is best avoided Treatment should continue as long as there is any photophobia and *even after* the acute attack the pupil must be watched and dilated periodically or anterior and posterior synechiae will ultimately develop If a mixture is thought necessary then salicylates can be prescribed In severe cases protein shock may be tried but caution must be exercised and therefore *preparations such as aolan or* lactolan should be given Two c c intradermally every third day is considered better than 5 c c intramuscularly once a week Where aolan or lactolan is not available then injection of sterile milk intramuscularly 2 c c increasing by 0 5 c c every week

till 5 c c is reached may be tried Where cow s milk is poor in quality buffalo s milk should be used

*Potassium iodide should under no circumstances be given*

(b) *Treatment of Sub acute and Chronic Iritis*

This may be the result of a badly treated acute attack or the affection of the eye may pursue a slow and progressive course especially in chronic iritis hence the danger in such cases for persons who are illiterate and who do not usually read is that they may not realise that their vision is being affected until the damage is done Even so it is remarkable how much vision can be maintained in spite of extensive damage

In this condition photophobia and lachrymation are not marked symptoms especially if the iritis is chronic The tolerance of the eye to leprous infection is some times remarkable Whether the iritis is sub acute or chronic the general principles are the same endeavour to dilate the pupil and maintain the maximum dilatation possible

Atropine (1 per cent ) drops are instilled three times a day for two or three days and this is followed by atropine ointment (1 per cent ) for a week If the pupil is not dilated by the end of the week scopolamine and atropine may be tried When the pupil does not dilate satisfactorily even after this the following procedure is suggested

Cocaine (3 per cent ) solution is instilled wait four minutes and then adrenalin 1 1 000 is given wait another four minutes and then use atropine drops (1 per cent ) and after half an hour repeat the procedure This may be done once a day followed on two or more occasions by atropine ointment or atropine and scopolamine ointment If the pupil still does not dilate satisfactorily the following subconjunctival injection may be given

| | | | | |
|---|---|---|---|---|
| ℞ | Atropine sulphate | gr | ¼ | (0 016 grm ) |
| | Cocaine | gr | ½ | (0 03 grm ) |
| | Liq adrenalin (1 1 000) | ♏ XLV | | (3 00 ml ) |
| | Distilled water | ʒ | 1½ | (6 00 ml ) |

*Dose* 3–5 ♏

Atropine cocaine solution should be made up and sterilised first after which liq adrenaline is added

After the injection wait two hours and follow up with double atropine treatment as outlined above every day for a week If the pupil does not dilate after this then there is no hope of improvement without an iridectomy but continue atropine until such time as the eye is quiet enough for an operation

In sub acute iritis where there is more circumcorneal inflammation and greater lachrymation and pain before any subconjunctival cocaine adrenalin atropine solution is injected trypan blue should be tried One injection of trypan blue sub conjunctivally sometimes has a dramatic effect in relieving pain and lachrymation The eye is cocainised and the patient placed on the table in a good light The eye is controlled by an assistant and 3–5 mins of a 0 1 per cent solution of trypan blue injected subconjunctivally This is followed by one of the above methods used to produce dilatation of the pupil

Sub acute iritis in contrast to chronic iritis usually shows circumcorneal injection some photophobia and pain whereas in chronic iritis the main sign is a bound down and fixed pupil

If there is associated conjunctivitis then the eye is washed out with saline or boric lotion In an intractable sub acute or chronic iritis a course of gold injections may be found useful remembering to give small quantities The dosage has already been indicated It is a good practice to use ung ox flav at night and dionine and boric as indicated below may be found useful in sub acute iritis accompanied by conjunctivitis and keratitis

C Keratitis

This may be of two varieties superficial and deep The affection may be confined to a few maculae or there may be more extensive damage and opacities form which are gradually progressive and ultimately involve the whole cornea This condition is serious and ultimately leads to total blindness Various methods have been employed to endeavour to clear it up but its treatment is not very satisfactory and if the infection can be stopped from spreading then something has been achieved It must be remembered that keratitis is always associated with iritis and therefore every effort must be made to dilate the pupil and maintain dilatation at the maximum The following treatment may be tried in this condition

*Dionine and Boric*

This is particularly useful in superficial keratitis associated with inflammation of the conjunctiva and sclera Two per cent solution of dionine is used increasing gradually to 4 per cent The strength is increased as soon as the eye ceases to lachrymate with the weaker solutions Ultimately dionine and boric powder equal parts can be used placing a small quantity of the powder in the fornix and repeating the application once a day Persistent treatment is useful when the opacities are small and in sub acute and chronic inflammatory conditions of the cornea and sclera

If there are no inflammatory conditions and where the keratitis is superficial sub conjunctival injection of normal saline may help to clear the opacities The dose is 0 2 c c increasing each week until 1 c c is reached In deep keratitis care must be exercised for sometimes subconjunctival injections are found to be harmful

Where patients are undergoing out patient treatment or if treatment needs to be continued over a long period then 1 per cent quinine bisulphate ointment may prove of some value More than six subconjunctival injections of saline are not advised When the course is over then quinine bisulphate ointment or dionine and boric powder should be continued daily

In all forms of keratitis it should be assumed that there is an associated iritis and therefore the pupil should be dilated and atropine administered as indicated under sub acute iritis When the eye is quiet and the opacity obstructs vision then iridectomy sometimes is of help but great care must be exercised in choosing cases for operation

*Operative Procedures*

A word of warning is necessary in connection with operations on eyes which have become invaded by the M leprae Unless the operation is to save sight opthalmologists should exercise the greatest caution before deciding to interfere surgically for three reasons

(1) It is almost impossible to estimate when the eye is quiet and haemorrhage into the anterior chamber is a common complication in all operations involving the iris

(ii) The iris is very friable and hence iridectomy is difficult to perform

(iii) An incision into the eye with any keratitis in leprosy or if the cornea is anaesthetic is so often followed by an extension of the opacity and ultimately loss of sight that many consider the risk too great unless the patient has already lost his sight and the operation is performed as a last resort

When all the elements of the eye are involved and the eye is useless unsightly and painful *then enucleation should be performed*

*Glaucoma in Leprosy*

Usually in leprosy the eye is soft and seldom does one find the tension raised and therefore there is little fear in producing secondary glaucoma under the intensive atropine medication recommended The probable reason for this is because leprosy involves the ciliary body early and destroys or inhibits its function In acute and sub acute iritis occasionally there is experienced a rise of tension then atropine must be stopped and active measures taken to reduce the tension hence when there is acute or sub acute iritis and treatment is started for the first time then homatropine should be tried first Sometimes one finds in acute or sub acute iritis an eye may become sensitive to atropine If so atropine should be stopped and when the pupil has recovered careful medication with homatropine should be started It may be found that after a while the eye may be able to stand the full treatment laid down for this *condition No hard and fast rules can be laid down each case must be treated as* individual experience dictates

The fundamental principles in treatment of eye lesions are

(i) Cleanse the eye by frequent douching
(ii) Relieve pain and protect by eye shade or dark glasses
(iii) Dilate the pupil by every possible means
(iv) Keep every case under careful observation and if the iris is damaged dilate periodically, say once a month to prevent further adhesions

When colour vision is affected and there is an associated keratitis the outlook is extremely grave It must be said however that a great deal of palliative treatment can be done and if blindness is not staved off in many cases at least the day when the eye becomes completely sightless painful and useless may be considerably delayed Patient persistent intelligent treatment brings in handsome dividends for it maintains the vision of the patient possibly for many years and earns his gratitude

## B TREATMENT OF LESIONS OF THE NOSE, MOUTH AND THROAT

**(a) Lesions of the Nose**

It is extremely important periodically to examine the nose in all cases of leprosy especially in lepromatous cases Neural leprosy except in the tuberculoid case gives rise to no nasal symptoms In tuberculoid leprosy however much discomfort may arise as a result of swelling and oedema of the mucous membrane causing blockage Treatment is undertaken to reduce the inflammation and thereby establish free drainage Where there is much swelling of the mucous membrane and the damming back of the

secretions then a warm alkaline douche should be prescribed Following this the swollen mucous membrane should be treated by a solution of ephedrine (3 per cent ) to which can be added 1 c c of 1 1 000 solution of adrenalin to every ounce of the mixture This mixture is best placed in an atomiser Benzedrine and other vasoconstrictors may also be found useful when available When the acute reaction condition subsides then all nasal symptoms also are alleviated but these measures will help relieve the temporary discomfort which arises through blockage of the nasal passage in the acute reaction of tuberculoid leprosy

In lepromatous leprosy in the early stages where there is no gross pathology of the nose it is probably better not to treat the nasal condition at all for as the skin *becomes less positive so the M leprae tend to disappear from the nose* If however the nasal smears are consistently positive and the skin tests show considerable improvement then the following nose drops may be prescribed for they may hasten the disappearance of bacilli from the nasal mucous membrane

| | | | | |
|---|---|---|---|---|
| R | Creosote | ʒ | II | (8 0 ml ) |
| | Camphor | grs | CXX | (8 0 grm ) |
| | Hydnocarpus oil | ℥ | I | (30 0 ml ) |
| | Olive oil | ℥ | II | (60 0 ml ) |

If the mucous membrane is swollen then an alkaline douche followed by an ephedrine and adrenalin spray [1] will help to reduce congestion and the above nose drops should be inserted after spraying the nose

When crusts form and there is severe blockage of the nose the following procedure is advocated

(*a*) Liquid paraffin is inserted the night previously to soften the crusts
(*b*) Warm alkaline douche (soda bicarb drm 1 to 1 pint) in the morning
(*c*) The nasal passages are thoroughly dried
(*d*) The camphor creosote hydnocarpus oil drops are inserted in each nostril

If there is associated oedema and swelling of the mucous membranes between procedure (*c*) and (*d*) the nasal passages are sprayed with the adrenalin ephedrine solution There may also be epistaxis when this occurs the nose is cleansed gently with warm saline or soda bicarb solution and plugged with cotton wool soaked in adrenalin No vigorous douching should be attempted until all signs of bleeding have ceased If there are old signs of haemorrhage and ulceration then after the nasal douche the passage should be sprayed with 3 per cent glycerine and tannic acid or the following drops inserted

| | | |
|---|---|---|
| R | Glycerine | 11 parts |
| | Iodine | 1 part |

When there is ulceration and the nose is cleansed and dried as above some advocate the touching of the ulcers with chromic acid (5 per cent ) or with a chromic acid bead Muir (1943) has recommended anaesthetising the nose and applying 10 per cent trichloracetic acid with a fine brush repeating after two weeks We have had no experience of such treatment

Occasionally in both the acute condition of the mucous membrane resulting from

[1] The strength is 3 per cent ephedrine with 1 c c of a 1 1000 solution of adrenalin added to every ounce of the ephedrine solution

a tuberculoid reaction or in lepromatous leprosy the whole process may be complicated by a concomitant sinusitis which may be the result of the secretions and secondary infection of the sinuses General symptoms of sinusitis are noticeable viz pain discharge and possibly oedema The postural treatment according to the Proetz Parkinson technique should then be tried

The patient lies on a bed or table on his side with a pillow under the shoulder and his head bent over it He is told to breath through his mouth while a few drops of the following solution previously warmed are instilled into each nostril

| | | | |
|---|---|---|---|
| ℞ | Ephedrine hydrochlor | grs IX | (0 25 grm ) |
| | Sodium chloride | grs IX | (0 25 grm ) |
| | Aquam ad | ℥ I | (30 0 ml ) |

The patient continues to breathe through the mouth without swallowing for 2–3 minutes during which time the nasal mucous membrane shrinks and the ostia become more patent After this period the patient s nostrils are closed with the balls of his thumbs and he is instructed to close his mouth and attempt to inhale vigorously This manoeuvre results in the solution entering the sinuses after which the patient is turned downwards and the excess solution drains from the nose

Plastic operations for the repair of nasal deformity have not been attempted on a large scale firstly because all such operations depend on the quiescence of the disease and secondly surgeons have not devoted much attention to the subject We feel however that here is a profitable field for research

### (*b*) Lesions of the Mouth and Pharynx

As described in an earlier chapter these lesions are painful and distressing In all cases vitamin B complex especially riboflavin should be prescribed This can be given in the form of yeast (one ounce per diem) or one or other of the proprietary brands of tablets may be prescribed or if the patient is able to take it a whole wheat diet sprouting gram or other high vitamin content food Such a line of treatment is advocated because it is difficult to differentiate a glossitis from leprosy involvement and a pure aribinoflavinosis Apart from adding food rich in riboflavin the mouth should be kept clean and swabbed periodically with glycerine and borax or glycerine and tannic acid (2½ per cent ) if the mucous membrane is not too sensitive Instead of swabbing the mouth and nasopharynx this may be sprayed with glycerine and tannic acid especially when there is evidence of leprous granulation tissue Infections of the teeth and pyorrhoea aggravate such conditions and therefore oral sepsis must be dealt with and dental care and hygiene emphasised It is reported that promin or diasone helps considerably in this painful and distressing sequelae of oral leprosy

### (*c*) Lesions of the Throat

As pointed out in an earlier chapter throat lesions in leprosy are not only serious but are dangerous or potentially dangerous to life Where there is much swelling and oedema an ephedrine spray should be tried The nozzle of the de Vilbiss spray is turned down and the patient asked to inhale As he inhales the back of the throat is sprayed with the lotion An alternative remedy especially when there is ulceration is glycerine and tannic acid (2½ per cent ) If there is hoarseness and not much evidence of inflammation hydnocarpus oil (pure) should be instilled into the larynx by means of

a laryngeal syringe As modern methods of direct laryngoscopy are perfected a wide field of possibilities we hope will be found in the treatment of leprosy of the throat which at present is so distressing and for which so little can be done

The fear of every physician dealing with advanced leprosy of the throat especially of the ulcerative variety is oedema of the glottis which may necessitate an immediate operation with a high mortality Unless all other measures fail to relieve the obstruction tracheotomy should not be attempted in the acute stage As a measure of temporary relief the patient should be given an injection of adrenalin and if much secretion adrenalin and atropine and inhalations of tr benzoine co and a steam kettle will be found useful Under no account should morphia be given to relieve distress as this depresses respiration and frequently gives the patient a feeling of impending death When the acute condition subsides a low tracheotomy is attempted but if the oedema of the glottis is not relieved immediately then an emergency tracheotomy must be done This is a simple operation in the quiescent stage but as so often happens patients wait till the condition becomes acute then the operation is fraught with difficulties

**Tracheotomy**

This is adequately described in textbooks of surgery One or two points however might be emphasised The patient should be prepared overnight by the administration of luminal grs ii Just before the operation $\frac{1}{100}$ atropine but no morphia is given The operation should not be unduly hurried The head is placed over a block under the nape of the neck or on pillows and the trachea stretched sufficiently to expose the site of operation but care must be taken not to produce acute distress It is better to have less convenience operating than a struggling frightened patient The first steps are taken quickly but not too rapidly and be sure of the completion of every step before going on to the next The operation is done under a novocaine block It is better to block a rectangular area leaving the line of incision free from novocaine solution for if much fluid is injected it obscures the field An incision is made in the midline and care is taken that an assistant holds the head straight and lightly stretched A dissection mostly blunt is made down to the trachea catching any bleeding points but not being excessively worried over venous oozing This will stop as soon as the trachea is opened It is very important to be certain that the trachea is exposed beginners tend to go too high and miss the rings of the trachea When the trachea is exposed steady it with one finger and plunge the knife between the rings with a sharp jab and twist the blade so as to maintain the opening patent then insert the tracheal dilators Once these are in allow the patient to cough up collections of mucous and pus The operator must remember to keep his mouth and eyes well out of the way for the explosive force of the cough when air enters the trachea is considerable When the air passages are clear carefully insert as large a tracheotomy tube as possible The rest of the operation can be completed more leisurely The tube is tied at the back of the neck by tapes bleeding points dealt with a few interrupted silkworm sutures inserted the operation area painted with acriflavine or dusted with sulphonamide powder and the patient returned to bed The inner tube is kept in for twenty four hours unless blockage occurs then it is carefully removed and the blockage relieved The outer tube remains for three months (see below for hygienic technique during this period)

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*Complications*

When the operation is done as an emergency the mortality is high and death may occur on the table through shock Occasionally the patient does not breathe when the trachea is opened and the tube is inserted Artificial respiration should be started a catheter passed and mucous sucked out of the trachea This may result in the removal of the blockage

Complications arising within twenty four hours to seventy two hours are

(*a*) Surgical emphysema (*b*) Haemorrhage (*c*) Aspiration pneumonia

(a) *Surgical Emphysema* This is usually due to the tube either not being inserted properly or being displaced by movement The patient should be taken back to the theatre and the tube be reinserted Do not attempt to reinsert the tube when the patient is in bed for difficulties may arise which can only adequately be dealt with in the theatre

(b) *Haemorrhage* This is an unusual complication but the patient must be returned to the theatre and the bleeding point ligatured

(c) *Aspiration Pneumonia* This fortunately is a rare complication but extremely serious Sulphadiazine or penicillin should be given in adequate dosages

*Delayed Complications*

If the patient survives a week he is likely to recover Either due to extension of the ulceration or constant irritation of dust particles of mucous and crusts are liable to form These can be prevented by careful technique in cleaning the inner tube For this purpose the patient is taught to remove the inner tube which is washed with soda bicarb then placed in Dettol after which it is rinsed in sterile water dried and well lubricated with hydnocarpus oil The oil will not only make the insertion of the tube easier but a little trickle finds its way down the trachea and helps to soften the crusts which are liable to form After three months if no complications have arisen necessitating the removal of the outer tube the patient is taken on the table and the outer tube removed and the wound inspected after this when cleaning the tubes can both be daily removed as the tracheotomy opening is now permanent

While the operation of tracheotomy is a drastic one if successful it gives so much relief to the patient and makes the remaining days more comfortable that one should not hesitate to perform it As soon as it is decided that laryngeal leprosy has advanced so far that there is no alternative to tracheotomy then an operation should be under taken without delay

CHAPTER XVII

# TREATMENT OF TROPHIC ULCERS

TROPHIC conditions in leprosy result from injury to nerves and occur for two reasons

(a) Injuries which in the normal skin would not give rise to trouble in anaesthetic skin are not noticed and hence they become extensive and serious because the defensive reflex of pain is lost Hence pressure blisters burns both due to heat and idiopathic burns must all be considered under this head

(b) Lesions resulting from the disturbance of the neuro trophic functions of a limb

Both these factors usually operate simultaneously For instance pressure may give rise to a blister on a pressure point such as the head of a metatarsal bone but owing to the trophic condition of the skin a perforated ulcer arises which quickly affects the bone

The first sign although not constant of trophic disturbance in a limb is rarefaction of bones and this may occur without any evidence of ulceration As a result of such trophic disturbance there seems to be a local loss of calcium resulting in a further degree of rarefaction and then absorption of bone This absorption takes place whether there is actual ulceration or not It is interesting to note that digits do not drop off They are absorbed and even when all the phalanges or the carpal or tarsal bones become absorbed there is still little evidence of the five finger nails at the distal end of the stump

Actual necrosis and sequestra formation with compensatory callus formation is never seen apart from sepsis The sequel is anaesthesia injury sepsis necrosis with or without sequestra As will be pointed out under operative procedures sepsis is less of a menace in leprosy than in the healthy individual and contrary to the generally accepted opinion anaesthetic areas frequently heal and granulate better than normal skin This has been explained by the fact that changes in the walls of the veins are more frequent than in those of the arteries in leprosy and hence an almost permanent state of Bier s passive congestion may be present in the limbs Not only is sepsis less common but healing is sometimes more efficient It is impossible in this chapter to deal in detail with X ray changes in bones readers who are interested are referred to the excellent article in *Radiology* by Fadget and Mavmol (1944)

If then it is the case that no necrosis of bone will result unless there is previous injury it is absolutely essential to endeavour to prevent injury and damage to soft tissues which ultimately leads to trophic ulceration extension of bone and necrosis of the phalanges metatarsal or tarsal bones It cannot be too strongly stressed that patients who have anaesthesia must exercise the greatest care For instance they should be warned not to undertake any work which involves the handling of hot utensils e g cooking vessels When they drink hot fluids they should be instructed to take care that they do not hold hot brass vessels or allow the hot liquid to spill over their hands In this connection nurses or attenders who care for patients with anaesthetic leprosy should be reminded that what is pleasantly hot for a normal individual is too hot for a person with anaesthesia Warnings should also be issued to patients against

*Complications*

When the operation is done as an emergency the mortality is high and death may occur on the table through shock Occasionally the patient does not breathe when the trachea is opened and the tube is inserted Artificial respiration should be started a catheter passed and mucous sucked out of the trachea This may result in the removal of the blockage

Complications arising within twenty four hours to seventy two hours are

(*a*) Surgical emphysema (*b*) Haemorrhage (*c*) Aspiration pneumonia

(a) *Surgical Emphysema* This is usually due to the tube either not being inserted properly or being displaced by movement The patient should be taken back to the theatre and the tube be reinserted Do not attempt to reinsert the tube when the patient is in bed for difficulties may arise which can only adequately be dealt with in the theatre

(b) *Haemorrhage* This is an unusual complication but the patient must be returned to the theatre and the bleeding point ligatured

(c) *Aspiration Pneumonia* This fortunately is a rare complication but extremely serious Sulphadiazine or penicillin should be given in adequate dosages

*Delayed Complications*

If the patient survives a week he is likely to recover Either due to extension of the ulceration or constant irritation of dust particles of mucous and crusts are liable to form These can be prevented by careful technique in cleaning the inner tube For this purpose the patient is taught to remove the inner tube which is washed with soda bicarb then placed in Dettol after which it is rinsed in sterile water dried and well lubricated with hydnocarpus oil The oil will not only make the insertion of the tube easier but a little trickle finds its way down the trachea and helps to soften the crusts which are liable to form After three months if no complications have arisen necessitating the removal of the outer tube the patient is taken on the table and the outer tube removed and the wound inspected after this when cleaning the tubes can both be daily removed as the tracheotomy opening is now permanent

While the operation of tracheotomy is a drastic one if successful it gives so much relief to the patient and makes the remaining days more comfortable that one should not hesitate to perform it As soon as it is decided that laryngeal leprosy has advanced so far that there is no alternative to tracheotomy then an operation should be under taken without delay

CHAPTER XVII

# TREATMENT OF TROPHIC ULCERS

TROPHIC conditions in leprosy result from injury to nerves and occur for two reasons

(a) Injuries which in the normal skin would not give rise to trouble in anaesthetic skin are not noticed and hence they become extensive and serious because the defensive reflex of pain is lost Hence pressure blisters burns both due to heat and idiopathic burns must all be considered under this head

(b) Lesions resulting from the disturbance of the neuro trophic functions of a limb

Both these factors usually operate simultaneously For instance pressure may give rise to a blister on a pressure point such as the head of a metatarsal bone but owing to the trophic condition of the skin a perforated ulcer arises which quickly affects the bone

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knocking their feet or hands for slight trauma will raise a blister which if over a metatarsal bone may result in a trophic ulcer and extension to bone with resultant necrosis Massage exercise avoidance of any injury and cleanliness are the *secrets of prevention* of damage in neural anaesthetic leprosy If in addition it is remembered that crevices between the toes should be kept dry and every possible precaution taken to prevent excessive perspiration then even when a foot is severely damaged it is remarkable how much function can be retained

With this introduction we pass *on to the more detailed consideration of* trophic ulcers Trophic ulcers in general can be divided into those ulcers which do not obviously affect bone and those which have extended down to bone which can usually be felt



Fig 1. —Extensive ulceration of foot with much sloughing



Fig 1 3 —Ulcer healed as a result of conservative measures

at the base of the ulcer Further under trophic conditions must be included burns and injuries which in normal individuals would cause little or no damage but result in extensive ulceration in patients suffering from leprosy In the treatment of all ulcers whether they affect the bone or not whether they are the result of slight or marked trauma the fundamental principles are to cleanse the ulcer and endeavour to encourage the formation of healthy granulation tissue and then to protect the granulation and thus aid healing The remedy which has been found of most value for cleansing ulcers and encouraging the formation of healthy granulation tissue is the well known eusol lotion It is our experience however that for eusol to exercise its maximum benefit the dressing should be changed two or three times a day Further it should be borne in mind that the dressing should be applied as a pad and that the gauze should not be drenched in the lotion It is recommended that pieces of gauze should be soaked in eusol and wrung out so that excessive fluid does not run down and soak all the surrounding tissues for if it does an unhealthy condition of the skin results and this forms an excellent nidus in which septic organisms can flourish If

eusol is not available or if the patient cannot get frequent change of dressings then the remedy which is found most cleansing is eucalyptus oil and iodoform This remedy as far as is known was first used some years ago by Dr Lang then of Chandkuri

The formula is as follows

| | | | |
|---|---|---|---|
| ℞ Iodoform | grs | X | (0 6 grm ) |
| Eucalyptus oil | ℥ | I | (30 0 ml ) |

When the formation of granulation tissue has commenced the dressing sometimes sticks owing to the tendency of the eucalyptus oil to evaporate If this is troublesome equal parts of castor oil or olive oil is added

Workers in institutions have often to admit persons with foul smelling ulcers associated with oedema threatening or actual cellulitis and much pus formation The pus is frequently found to be oozing from multiple sinuses Our usual practice is to soak the limb in warm saline or in hypertonic saline Potassium permanganate may be used to reduce the foul odour but should be changed as soon as the lotion turns brown Where there is much oedema and sloughing saturated magnesium sulphate baths are used There are one or two points to be borne in mind when prescribing such a treatment Firstly remember to test the temperature of the water before immersing a limb for the patient cannot appreciate heat and secondly after soaking which should not be for more than ten minutes gently remove all sloughs The sloughs usually separate easily but may take several days to come away completely After removing the sloughs dry the limb thoroughly and spirit it well so that excessive moisture is not left to encourage bogginess of the tissues Finally raise the leg and apply strips of gauze which have been soaked in eusol lotion and wrung out to remove excessive fluid bandage and immobilise the limb by splinting Sloughs can sometimes be caused to separate more quickly if the ulcer is dressed with sterile magnesium sulphate powder Dressings should be changed three or four times a day if necessary Until the ulcers are clean and the oedema subsides the foot of the bed should be raised Where pus is extending and cellulitis is threatened incisions should be made We usually find multiple small incisions preferable to larger ones If there are any sinuses these should be douched with eusol or saturated mag sulph or syringed out with Dettol (1 _0 solution) as advocated by Ryrie (1936) It is usually found that in trophic conditions associated with oedema and cellulitis that once the septic condition is controlled the ulcers begin to granulate freely and not infrequently excessively When the temperature remains high indicating septic absorption then the sulphonamide products are indicated It should be remembered that sulphonamide preparations and of these sulphathiazole or sulphadiazine are the most useful should not be given unless or until there is free drainage or pus Frequent differential counts should be done particular attention being given to the total white count and the relative number of the polymorphonuclear leucocytes



Fig 14 — X ray phot[illegible] anaesthetic leprosy of hand showing bone absorption



Fig 1 5.—Trophic ulcer head of first metatarsal bone but not extending to joint and bone not exposed

In foul smelling ulcers associated with necrotic bone we do not think it advisable to remove the bone or scrape it until the sepsis has been controlled Operation if undertaken should only be confined to measures which help drainage While sepsis is usually of a low grade occasionally a virulent streptococcal infection is encountered This may result from fresh injury or from spreading of an infective process due to attempting extensive surgical procedures before the sepsis is controlled In leprosy when this occurs the situation is always grave and the mortality high All measures must be taken to localise the infection and with the availability of penicillin on a large scale the mortality from a virulent streptococcal infection should be reduced considerably

When the sepsis has been controlled and a clean granulating surface produced and healing commenced then a protective dressing is applied It should be remembered however that neither an oily dressing nor an ointment can be applied if there is much oozing In the presence of excessive oozing we usually continue dressing with eusol until this has stopped Then either eucalyptus oil and iodoform with equal parts of castor oil or the following ointment is applied

| | | | | |
|---|---|---|---|---|
| ℞ | Acid boric | grs | XV | (1 0 grm ) |
| | Oil eucalyptus | ♏ | XV | (1 0 ml ) |
| | Bismuth subn | grs | LX | (4 0 grms ) |
| | Zinc oxide | grs | CLXXX | (12 0 grms ) |
| | Castor oil | ℥ | I | (30 0 ml ) |

If granulations are excessive painting with 2½ per cent aqueous solution of silver nitrate or touching the granulations with a silver nitrate stick or with copper sulphate is sometimes effective

These then are the general measures adopted in treating trophic ulcers with no marked bone involvement The only further point to stress is that whereas we do not hesitate to sacrifice a toe we refrain from sacrificing a finger or even part of a finger as long as possible and remove the phalanges only when it is absolutely unavoidable for a deformed hand or finger is usually better than none at all It is remarkable how seldom one needs to undertake operative interference in the case of infection of the hand or fingers except local incision for purposes of more adequate drainage

Lowe and Chatterjee (1937) recommended injecting trophic ulcers once a week with hydnocarpus oil These workers as well as others have reported considerable success with this procedure There are two methods of giving the injections into the ulcers and these may be called the superficial and the deep methods In the former the needle is inserted into the layer just under the plantar fascia but the point does not penetrate into the deeper layers and multiple injections are given all round the ulcer not more than 1 c c being injected at one sitting In the deep method on the



Fig 1 6 —After prel m n ry cl nsing ul inject on with hydnocarp i oil h week Heal ng ( ee fig 1 )



Fig 1 7 —Inje t n contin l om plet ly h al l t th en l of six weeks



Fi 1 8 —T opl ic i lce at tl ba of n l x fi ge (oc p tional) Th type of ulcer r rely een on the finger but is m l to th t of the fo t nd he l d on inj t on t tm nt



Fig 1 9 —Ul h l l on nject on treat m nt a mo th late

other hand the needle is inserted through the surrounding normal tissue penetrating deeply into the tissues of the foot and pointing towards the centre of the ulcer the injections are given diagonally the proximal and distal margins of the ulcer being injected one week and the inner and outer the next week Half c c to 1 c c of the medicine is injected at each puncture After the injection the ulcer is dressed with the same remedy which is used for the injection Hydnocarpus oil is the most convenient substance but cod liver oil is equally effective and the ulcers heal satisfactorily with *either remedy* The two main precautions necessary are never to inject a dirty ulcer and to cleanse the surrounding skin and base of the ulcer adequately for if the wound should become infected a considerable amount of sloughing may result



FIG 130—Ulcer over heads of first and second metatarsal bones suitable for injection treatment

All ulcers do not respond to injection treatment and indiscriminate injection of ulcers will only bring an excellent method into disrepute Generally speaking where there is much thickening of bone and especially if there is much pain associated with periostitis or if there is not an adequate covering of subcutaneous tissue over the head of a metatarsal bone injection treatment will fail The ulcers which heal most readily are the clean perforating ulcers with thickened skin and without excessive necrosis of bone or periostitis Injection treatment if precautions as to antisepsis are carefully taken will do no harm and is worth a trial before resorting to operative procedures While the deep method of injection in our opinion is the best with ulcers over the internal or external malleolus where there is no marked destruction of tissue the superficial method will be found to be more satisfactory but on no account should this be used if there is much sepsis oedema or inflammation of the surrounding tissues

From time to time strapping of ulcers has been advocated and Paul (1936) in Ceylon recommended a procedure similar to that used for varicose ulcers namely with the leg raised and the veins emptied overlapping pieces of adhesive strapping are firmly placed over the ulcer the strapping is left until it is ultimately separated by the gradual soaking of the exudate from the ulcerating surfaces The chief objection to this method is that the foul smell from the dressing is usually complained of by the patient and the nursing staff naturally dislike such a method If this method is resorted to we prefer filling the cavity with a 5 per cent sulphonamide paste bandaging or strapping and leaving it for a week The following is the prescription for sulphonamide paste

| | | |
|---|---|---|
| ℞ Sulphonamide | grms | 5 |
| Adep lanae | grms | 70 |
| Paraffin liqd | grms | 25 |

The results of this method are encouraging and where the ulcer is not excessively

dirty then this method saves dressing and promotes healing For ulcers over the external or internal malleolus sulphonamide paste with splinting sometimes succeeds when all remedies have failed The cost is not excessive when the saving of dressings is taken into consideration Oberdoeffer and Collier (1939) have recommended the following ointment

| | | | |
|---|---|---|---|
| ℞ Mercurochrome | ℥ | II | (60 0 grm ) |
| Honey | ℥ | VIII | (240 0 ml ) |
| Cod liver oil | ℥ | VIII | (240 0 ml ) |
| Zinc oxide powder | ℥ | IV | (120 0 grm ) |
| Bismuth subn | ℥ | II | (60 0 grm ) |
| Vaseline | ℥ | XII | (360 0 grm ) |



Fig 131 —Ulcer he l d after nje t n tre tn t



Fig 13 – Ext n l ov first m ta t rs l l ne— i tabl fo inj t n tr tn nt

The honey and mercurochrome ointment is very expensive and therefore in the Lady Willingdon Leprosy Sanatorium mercurochrome is replaced by eucalyptus oil and appears to be as satisfactory The prescription is as follows

| | | | |
|---|---|---|---|
| ℞ Ol eucalyptus | ℥ | ½ | (15 0 ml ) |
| Honey | ℥ | II | (60 0 ml ) |
| Cod liver oil | ℥ | II | (60 0 ml ) |
| Zinc oxide powder | ℥ | I | (30 0 grm ) |
| Bismuth subn | ℥ | ½ | (15 0 ml ) |
| Vaseline | ℥ | III | (90 0 grm ) |

When an ulcer is dirty especially when the surrounding skin is affected and the surface not oozing application of ung hydrarg sometimes produces healing When the surface of the ulcer is oozing and the edges boggy moist dressings are better avoided and

particularly if there are large painful ulcers over the lower part of the limb the following antiseptic dressing will be found useful

| | | | |
|---|---|---|---|
| ℞ Sulphonamide[1] | grs | XXV | (1 66 grm ) |
| Kaolin | grs | LX | (4 00 grm ) |
| Cod liver oil | ♏ | XLV | (3 00 ml ) |
| Glycerine | ℥ | I | (30 00 ml ) |

The kaolin acts as an absorbent and the glycerine as an astringent This cream will also be found useful in the so called chronic tropical ulcers

When a good clean granulating surface is produced then acriflavine and paraffin



Fig 133 —Extensive ulceration and considerable sloughing over external malleolus



Fig 134 —Ulcer healed with sulphonamide paste and strapping

may be tried It protects the newly formed granulations and produces healing The method of preparation is as follows

Dissolve 0 5 grms acriflavine in 25 c c of warm boiled distilled water Sterilised wool fat 30 grms is put in a sterile mortar and the acriflavine solution is added in small quantities and finally liquid paraffin to 100

For breaking down nodules of the legs and arms and when the granulating surfaces are clean the following modification of Unna s paste may be tried

*Unna s Paste*

| | | | |
|---|---|---|---|
| ℞ Water | ℥ | X | (0 6 ml ) |
| Gelatine (sheet) | ℥ | VI | (0 4 grm ) |
| Glycerine | ℥ | X | (0 6 ml ) |
| Zinc oxide powder | ℥ | VI | (0 4 grm ) |

[1] No particular sulphonamide preparation is suggested for recent research reveals fresh and more effective preparations and therefore the particular sulphonamide is left to the individual physician s choice

In 10 oz of hot water (in a water bath) dissolve 6 oz of gelatine Add 10 oz of glycerine while the fluid is hot (still in water bath) Add slowly 6 oz of zinc oxide finely powdered stirring slowly (still in water bath) Keep the paste warm until used

Use when warm applying the mixture in a similar way as one applies a plaster bandage The preparation hardens and can be left on from four days to a week or ten days according to the nature of the ulcers and the amount of exudate This method became prohibitive during the war years

Another method which also was advocated by Milroy Paul is putting the limb in plaster When the ulcer is clean and when there is no discharge then by resting the leg in a plaster case and incorporating a stirrup iron into the plaster frequently results



Fig 135 —Ulcer unsuitable for injection treatment healed after metatarsal bone was removed



Fig 136 —Scar left after removing third metatarsal bone and leaving the third toe

in the healing of the ulcer Before applying the plaster the limb must be raised and the engorged veins emptied The patient should be given crutches The plaster is kept on for a month or six weeks indications for removing the plaster are pain discharge or a foul smell It must be remembered that while superficial pain is lost the pain resulting from pressure either from the plaster bandage or from inflammatory products is not eliminated and therefore is a warning sign should anything go wrong

When ulcers are healed and there is deformity resulting from the downward dislocation of the heads of the metatarsal bones then a metatarsal bar should be placed on the shoes if possible This raises the arch of the foot and prevents excessive pressure on the heads of the bones and hence eliminates the greatest cause of ulceration namely pressure

The operative procedure which is commonly resorted to apart from amputation of the phalanges is the removal of the metatarsal bones

**Indications**

This operation should be done if the following conditions are present

(1) *There is an ulcer leading down to the head of the metatarsal bone* the bone being uncovered by granulation tissue

(2) Ulcers which have *resisted all local measures* and which involve not more than two metatarsal bones especially if the following signs are present

- (a) A sinus leading to necrotic bone
- (b) Pain on pressure over the metatarsal bone sometimes the bone is actually *movable when grasped between the finger and thumb*
- (c) Characteristic blackening of the foot
- (d) X ray evidence of irreparable damage to the bone

Another sign which is frequently present is a curious blackening of the skin over *the necrotic metatarsals and along with other evidence this sign may* be found useful

With regard to the removal of the metatarsal bones confirmation by X ray whenever possible is extremely important *for it gives evidence of the extent of damage to* other bones A general principle is that one should be as conservative as possible so that the shape of the foot is maintained otherwise further damage will *result as soon* as the patient walks hence only when absolutely unavoidable should the first metatarsal be removed

If more than two metatarsal bones are involved then it is useless to remove them all conservative methods should be persevered with and if these fail further more drastic operative measures will have to be resorted to The operation will now be described

The patient is prepared in the usual way the night before and gr ii of luminal (phenobarbitone) are given If the patient is nervous $\frac{1}{100}$ gr of atropine and $\frac{1}{4}$ gr morphia may be given before the operation The limb is devascularised by raising it and emptying the veins by massage a tourniquet is then applied When the tourniquet is applied the local anaesthetic is now injected This is advocated for two reasons first there is no fear of absorption of the local anaesthetic and secondly it remains longer in the *tissues when a tourniquet is applied first and therefore is more* efficient The technique is as follows infiltrate the nerves which pass under the external *and internal malleolus Then a band of infiltration is produced right across* the dorsum of the foot one inch above the proximal end of the metatarsal Finally a deep injection is given between the metatarsal bones If the second metatarsal is to be removed then the deep infiltration is placed between the first and second and the second and third If the local infiltration anaesthesia is done properly the only pain from which the patient suffers is the dull pain of the tourniquet

An incision is now made on the dorsum of the foot over the head of the metatarsal bone to be removed The bone is exposed over the whole length and the periosteum incised Confirmatory evidence of complete necrosis is seen in the ease with which the periosteum strips from the bone If the periosteum does not strip easily then *the bone* is probably not completely necrotic Always keep near to the bone and in this way the bone is freed from the surrounding tissues and both ends cleared *The distal joint* is then entered and the bone separated from its phalanx if the toe is not worth preserving this is removed at this stage *but a more aesthetic result is achieved by leaving the* toe if it is healthy No trouble arises if the tendon is removed as the toe becomes fixed

down by firm fibrous tissue When the distal joint is freed the proximal joint is then similarly dealt with The metatarsal is now ready to be dissected out Commence at the distal end and keeping near the bone gradually free it from adhesions and the underlying ligaments then the bone is seized with lion forceps and the final disarticulation is made The edges of the wound are trimmed and the cavity well packed with gauze soaked in glycerine and iodoform a tight bandage is then applied

It is our practice not to remove the tourniquet until the wound has been well packed and a tight bandage applied and the patient put to bed with the foot of the bed raised Secondary haemorrhage is rare The cavity left after the removal of the metatarsal bone may be packed with 5 per cent sulphonamide paste leaving the dressing for a week So far the results have been excellent even when a grossly infected bone has been removed By using sulphonamide paste dressings are saved secondary haemorrhage is reduced to a minimum and healing is quicker The dressing is changed once a week and the cavity repacked with sulphonamide paste Frequently when using this paste there is on taking off the dressings a somewhat penetrating and objectionable odour but this does not necessarily indicate infection



Fig 137—X ray photograph showing extensive involvement of the small bones of the tarsus Note absence of the metatarsal which has been removed Operation of choice would be an amputation through Chopart joint i e joint between calcaneus [illegible]

It is wise to keep in mind the following general principles

(a) As far as possible clean up the operation area of any acute sepsis

(b) Make a large enough incision in order to work properly and define the proximal joint before endeavouring to separate the bone

(c) Separate the bone from above and work downwards

(d) Try to avoid any injury to the articular surface of the cuneiform or cuboid bones

Recently Muir (1943) has advocated the plantar approach We believe that such an approach is anatomically unsound for two reasons

(1) The incision involves the disturbance of the main blood supply to the foot

(2) After the removal of the bone the chief support is the plantar fascia and an incision through it may damage this and hence lead to further ulceration

In co operation with Gass we have removed metatarsal bones from the plantar aspect and while we consider this approach not so satisfactory in cases where the head of the bones is so far dislocated that it appears in the wound the plantar approach exposes the bone better and the posterior ligament which is the most difficult to penetrate from the dorsal approach is more easily dealt with When the plantar approach is used then the tourniquet must be loosened before the wound is stitched because as stated the main blood supply—the plantar arch—is in danger of being severed This method is not recommended as a routine even though when successful healing appears to be quicker

When more than two metatarsal bones are involved then more drastic operative procedures are necessary A fundamental principle is to leave a weight bearing stump So often deformity of the hand is associated with damage to the feet and if the patient has to use crutches one of two things is liable to occur

(1) Damage to deformed and anaesthetic hands due to pressure from crutches
(2) Extra strain on the other limb which if anaesthetic and already damaged will break down

The choice of operation should be decided if possible by X ray If the smaller *tarsal bones are involved and the tarsal* metatarsal joint is intact then a Lisfranc operation should be recommended If the small tarsal bones are affected and the joints between the navicular and cuneiform bones or the cuboid and cuneiforms are affected then a Chopart s amputation should be attempted If the talus or os calcis is damaged then it is little use attempting either of these operations for sooner or later the stump will break down Conservative measures such as rest and a plaster of paris cast should be adopted and operation postponed and if the ulcer extends or does not heal then an amputation should be performed in the lower third of the leg

Cass advocates the Symes *operation* but our *experience on the whole has been* unfavourable largely because of the expense and difficulty of securing a good Symes boot Even if this is obtained there is a great tendency to further absorption of bones *through pressure resulting in a conical stump and permanent ulceration necessitating* amputation at a higher level

Lisfranc and Chopart s operations are now seldom performed in surgery therefore the main principles will be described The patient is prepared in the usual way and the operation done preferably under spinal anaesthesia or if contra indicated under local novocaine block An incision is made half an inch above the head of the fifth metatarsal bone A short dorsal flap is reflected The purpose of this is to expose the tarsal meta tarsal joint Theoretically the knife should be inserted into Lisfranc s joint behind the tubercle of the fifth metatarsal by strongly flexing the foot all the joints are then exposed but owing to the damage already done it is extremely difficult to deal with the joints in this simple manner Therefore the heads of the metatarsal bones are all exposed the foot firmly flexed and the joint which is easiest of penetration penetrated first Once one joint is penetrated then it is a simple matter to expose the rest of the joints remembering that the second metatarsal bone juts up a little because the cor*responding cuneiform bone is shorter When all the joints* are *penetrated* and the ligaments severed take an amputation knife keeping the foot strongly flexed the knife pointing towards the toes and the blade near to the bones then fashion a large plantar flap *If the flap is too short and sometimes in any case the navicular bone* juts out and is liable to make the stump uneven then this bone is better dissected out Loosen the tourniquet deal with the bleeding points and stitch the large plantar flap to the skin of the dorsum of the foot Dress with acriflavine and *return the patient to* bed with a firm bandage

Chopart s operation is done in exactly the same way but the incision passes through the articulation between the cuboids and os calcis the navicular and astragulus (talus)

Further points in this operation should be noted While a clean operating surface is essential yet if the foot is badly deformed one need not wait for the complete healing of the trophic ulcers These should be excised and the flap fashioned accordingly

It is remarkable how often a stump heals in spite of trophic ulceration If sepsis occurs it is usually mild the central stitches should be removed leaving the ones at either side these retain the stump in place and allow for healing by granulation tissue without distorting the stump As far as leprosy is concerned the fear that the tendo achillis if left will produce a twisting of the stump is in our experience quite unfounded In stitching the flap however care must be taken to stitch it as far as possible in the normal position of the foot for it is easy to twist the stump by not taking note of this and then further pressure points may result and in consequence the stump breaks down

If a Lisfranc and Chopart s cannot be done due to extensive damage then a lower third amputation should be performed When artificial limbs can easily be secured then the choice of the site of the amputation is influenced by this fact but when in the East good limbs are not available and when the patient so often insists on as little as possible being done then a lower third amputation is advised After forty eight hours in the case of a Lisfranc or Chopart s operation the wounds should be inspected If clean then dressings are continued with acriflavine Should there be any signs of sepsis the necessary stitches are removed and the wound dressed with eusol twice daily It is seldom that sepsis is alarming and it is amazing how well such flaps heal even in the event of the necessity of removing all but the lateral stitches In fact in limbs affected by neural anaesthetic leprosy risks can be taken which in a normal limb would spell disaster and surgeons who are used to dealing with normal feet are liable to be over cautious

It must be remembered that each physician has his own method of dealing with trophic ulcers and that one cannot have too many remedies at one s disposal because repeated changes have often to be made and it is the doctor who always has something up his sleeve who is most likely to be successful in the treatment of this distressing sequel of leprosy We feel that if the general principles of cleansing protecting the granulating surface and ensuring adequate drainage and maintenance of the blood supply with partial or complete mobilisation of the affected limb are borne in mind then the majority of ulcers will heal The more experience one has the more conservative does one s method become Amputation is only justified when life is endangered or for a painful and deformed limb which will not yield to conservative methods

CHAPTER XVIII

# A TREATMENT OF SYPHILIS AND LEPROSY

# B TREATMENT OF CERTAIN COMMON CONCOMITANT SKIN AFFECTIONS

## A Treatment of Syphilis and Leprosy

It has too often been assumed that because a patient with leprosy has a positive Wassermann reaction he therefore has syphilis In Chapter X evidence has been given which sets forth reasons for doubting this statement and strong support is furnished to the theory that a positive Wassermann or Kahn reaction may have no significance in leprosy and that physicians are not justified in giving anti syphilitic remedies in leprosy unless there are clinical signs of past or present syphilis or a history of infection

It is admitted that in the above experiment the method of treating syphilis if it were present would not meet with the approval of syphilogists and therefore not until a standard course of treatment is undertaken can one categorically state that a positive Wassermann in leprosy is not due to a spirochetal infection The most significant support however for the statement that advanced leprosy in itself causes a positive Wassermann is seen in the disappearance of a positive serological reaction when lepromatous leprosy becomes negative Recently Faget and Hilary Ross (1944) have confirmed this opinion

When dealing with large numbers of patients in a leprosy sanatorium or as out patients a physician will constantly come up against the problem of how to treat syphilis in the presence of leprosy While it is known that treatment for syphilis may precipitate a reaction it is felt that owing to the seriousness of the disease one should not therefore give ineffective courses but should give the full course as laid down by specialists If a reaction develops in the course of the treatment then anti syphilitic treatment should be suspended temporarily until the reaction subsides While making this statement it cannot be too strongly emphasised that the physician must be certain that the patient is suffering from active syphilis for we do not believe that one is justified in giving a course of treatment which is expensive and may precipitate reaction unless there is unequivocal evidence of syphilis To treat for syphilis on the assumption that a positive Wassermann reaction in leprosy is due to syphilis is neither beneficial to the patient nor to the reputation of the doctor

The remedy recommended because it is known to be less toxic and more readily excreted by the kidney is mepharside The dose should be calculated on the basis of 0 04 grm of mapharside for every 100 lb of body weight This dose should be given intravenously every five days for twenty injections Along with the course a ten weeks course of bismuth should be prescribed The dosage should be calculated as 0 2 grm of metallic bismuth and this is given intramuscularly once a week for ten weeks At the close of the treatment one months rest is advised and the Wassermann reaction taken If the reaction is still positive the whole course is repeated It is advised by some that four such courses should be given before one can assume that adequate treatment has been completed I am aware that such a regime is drastic

and not free from danger of reaction and therefore it cannot be too strongly emphasised that clinical evidence of syphilis must be present before a physician should embark on its treatment in cases of leprosy The combination of bismuth with arsenic helps it is believed to control severe reactions

The above regime should be carried out for all active cases of syphilis both in the primary or secondary stage In cardiovascular or neuro syphilis of under six months duration the above course should be preceded by six doses of bismuth prior to mapharside being given then the routine as advised is followed giving the remaining four bismuth injections making the total number of bismuth injections ten It would probably always be well to follow this practice in the treatment of syphilis in leprosy

In the treatment of children acetylarsen infantum is recommended and the following is the suggested dose recommended according to the weight of the infant

| | |
|---|---|
| Above 25 lb | 1 5–2 c c |
| Between 15–25 lb | 1–1 5 c c |
| Below 10 lb | 0 25–0 5 c c |

The injections are given twice a week intramuscularly and a total of twenty injections are given This is combined with 0 5 c c of bismuth once a week for ten weeks In children above twelve acetylarsen adult is administered the dosage is 1 5–3 c c

Whenever it is possible to give remedies intravenously then mapharside should be given according to the body weight as indicated

Some years ago a remedy termed Avenyl an organic preparation of mercury was recommended in the treatment of leprosy complicated by syphilis but as has been indicated in a previous chapter the evidence for its effectiveness is not conclusive The advantage of the remedy is that it dissolves in hydnocarpus oil but while one is not convinced of its efficiency in the treatment of syphilis much more work must be done before a definite statement to this effect can be made The following is the prescription when Avenyl is used

| | | |
|---|---|---|
| ℞ | Avenyl (Burroughs Wellcome) | grm 0 25 |
| | Hydnocarpus oil | 100 c c |
| | Creosote (double distilled) | 0 5 c c |
| | *Dose* 1–10 c c | |

The method of administration is that laid down already but instead of the pure hydnocarpus oil being used hydnocarpus oil with Avenyl is given for subcutaneous injections If Avenyl is used it is suggested it be used instead of bismuth rather than as substitute for the arsenic preparations and that a three months course be given That is hydnocarpus oil with Avenyl be given for three months instead of hydnocarpus oil alone and in the dosage already recommended for subcutaneous injections of the oil While we ourselves have ceased using Avenyl it is mentioned here because some authorities advocate it and further trials are necessary before any definite opinion concerning its efficacy is given

The following principles cannot be too strongly emphasised

(1) Be sure the patient is suffering from syphilis
(2) If there is unequivocal evidence of this treat along modern lines and efficiently
(3) Give a preliminary course of six injections of bismuth before commencing mapharside

The recent work on penicillin and the treatment of syphilis is likely to revolutionise the whole therapeutics of this subject It will however be some time before penicillin is readily available or cheap enough for it to be used in leprosy sanatoria

**B Treatment of Certain Common Concomitant Skin Affections**

Because a fair proportion of cases which either seek admission to a leprosy institution or present themselves for treatment at an out patient leprosy unit suffer from various complicating skin conditions it may be of value to indicate helpful lines of treatment It is not the intention to endeavour to discuss the treatment of dermatological conditions in general but only to indicate practical methods of dealing with the most common skin infections It is to be expected that persons suffering from leprosy are more prone to pyogenic scabetic and fungus infections of the skin than the normal person Firstly because many among those who seek admission into leprosy institutions are not in a position to attend to the routine hygiene of the skin which is of such importance in preventing skin infection and secondly the skin is often damaged because of anaesthesia resulting in disturbances of the normal sweat mechanism Not only may the skin be affected thus but in nodular or infiltrative lepromatous leprosy many of the elements of the skin are destroyed as a result of the massive granulomatous invasion in the corium

Further many patients suffer from a chronic avitaminosis and therefore the lack of vitamin A and vitamin B complex is liable to produce pathological conditions of the skin which not only in themselves cause lesions but increase the vulnerability of the skin to infections and hence aggravate or result in the appearance of septic and other skin manifestations Hence in this section I shall only attempt briefly to summarise the practical methods found useful in dealing with the infective and parasitic dermatoses

The commonest infection with which the physician in charge of a leprosy institution has to deal is scabies Scabies in the East and particularly in India is practically always complicated by a septic condition of the skin usually a staphylococcal infection of the hair follicles Impetiginious lesions in the form of true impetigo contagiosum are not common probably because the infecting organisms are much more commonly the staphylococci and not the streptococci In scabetic lesions also the element of secondary infection is always prominent and one seldom comes across a case of scabie which has not a complicating septic condition of the skin hence in its treatment the physician cannot confine himself to treating the scabies alone but must attend to the pyogenic condition of the skin in general

So far in leprosy institutions scabies has been dealt with by means of sulphur ointment Owing to the initial difficulty of securing benzyl benzoate and the cost of the remedy it has not been tried out on any large scale The problem which frequently arises in the management of a large number of cases is the difficulty of ensuring that any sulphur ointment prescribed is adequately administered and therefore if one of the sulphur preparations is used it must be under strict supervision If this is possible three applications of Danish ointment will prove effective the following is the method of preparation and technique of administration

(1) 1 kg of sublimated sulphur is dissolved by heating it gently in 1 kg of a 5 per cent solution of potassium hydroxide—a clear yellow solution resulting

(2) 225 grm of vaseline and 225 grm of lanoline are mixed together no heat being used

(3) To this mixture 375 grm of the solution of sulphur in potassium hydroxide (see (1)) is added

(4) Fresh zinc hydroxide is prepared by mixing 28 grm of zinc sulphate and 40 grm of a 20 per cent sodium hydroxide Then this is added to the ointment

(5) Liquid paraffin is added to make a total weight of 1 000 grm

(6) 5 grm of benzaldehyde is added to check the somewhat disagreeable smell of sulphurated hydrogen

The patient is first bathed then after the ointment has been applied he is made to sit in the sun all day He is given a good wash at night and the process is repeated the next day When there is an extensive infection of scabies throughout an institution the following procedure will clear it up more rapidly than any other in our experience The patient is given a bath and if possible scrubbed and the following solution is painted all over the skin from the neck downwards giving special attention to the groins and axillae remembering scabies never affects the skin above the line of the neck

| | | |
|---|---|---|
| ℞ | Sulphur | 1 part |
| | Slaked lime | 1 part |
| | Water | 10 parts |

*Boil down to five parts and cork well*

The patient is then given a bath in the evening and the procedure repeated each morning for three mornings Then the patient is encouraged to take an oil bath for the next three or four days It will be seen that the above treatment is drastic but a sulphur dermatitis is rare in the dark skin For milder degrees of scabies hydnocarpus oil with 5 per cent sulphur will be found a very suitable routine remedy

Frequently with both septic infections and fungus conditions a condition of the legs is seen which is the result of neglect and scratching the lesions become encrusted and scaly and if secondarily infected pus may form under the scales No remedy will in such cases be of any value until the scales have separated The following formula for Lassar s paste is recommended

| | | | |
|---|---|---|---|
| ℞ | Acid salicyl | ʒ I | (4 0 grm ) |
| | Zinc oxide | ʒ II | (8 0 grm ) |
| | Starch | ʒ II | (8 0 grm ) |
| | Vaseline | ʒ IV | (16 0 grm ) |

If the encrustations are thick then starch poultices may have to be applied for several days instead Once the scales have separated then the most generally useful ointment is ung hydrag of the British Pharmacopeia Sometimes if the scaliness is still present this is combined with 5–10 per cent salicylic acid and if when the scales have separated a raw oozing surface has resulted then calamine lotion should be applied If the discharge is slight the following cream will be found useful

| | | | |
|---|---|---|---|
| ℞ | Zinc oxide | grs CLXXX | (12 0 grm ) |
| | Sulph sublim | grs VII | (0 45 grm ) |
| | Ac carbol | ♏ VIII | (0 5 ml ) |
| | Lanoline | ʒ ss | (2 0 grm ) |
| | Aq calcis | ℥ I | (30 0 ml ) |
| | Ol olivei | ℥ I | (30 0 ml ) |

If the cream is not drying enough then add calamine drms II This preparat is also excellent for prickly heat but calamine should not be added as it i

drying for this condition If the eczematous condition is accompanied by swelling and oedema of the lower extremities raise the legs and follow the principles already laid down remove the crusts and soothe raw surfaces Apply strong antiseptic or fungicide ointment only when the acute condition has subsided

For fungus infection of the body if associated with scaling the following ointment is useful

| | | | |
|---|---|---|---|
| I | Acid salicyl | grs XXX | (0 2 grm ) |
| | Acid benzoic | ʒ I | (0 4 ml ) |
| | Paraff moll | ʒ II | (0 8 ml ) |
| | Coconut oil ad | ℥ I | (30 0 ml ) |

This is excellent for the common condition of Dhobie s itch In the European it may be found necessary to reduce the strength by half Other remedies such as chrysarobin ointment may be used but Whitfield s ointment is most generally useful

Finally a word may be mentioned concerning the common fungus of the foot and hands (Madras foot Bengal rot etc ) When there are blebs and a watery discharge prick these and apply 1 per cent gentian violet in spirit Keep water from the part and cleanse with olive oil When blebs have ceased then either chrysarobin ointment or Whitfield s should be prescribed When there is much scaliness apply Lassar s paste or starch poultices then Whitfield s or chrysarobin ointment If there is as often is the case an eczematous condition and inflammation then the tissue must be soothed first If there is a certain amount of sepsis then preliminary dressings with warm eusol for a few days will be found beneficial When the skin is clean then calamine lotion is applied or if not much oozing the zinc calamine cream already given and then as the acute condition clears pass on to a fungicide ointment first half strength and then full strength It is well to remember that this condition of the foot is almost always accompanied by a fungus infection in the groin and axilla which must be treated It is extraordinary how frequently even in Europeans the common Dhobie s itch is either neglected or not recognised and thus the feet and hands constantly become reinfected

A common condition in institutions is a widespread infection with tinea versicolor (pityriasis versicolor) This is treated either by a 3 per cent salicylic acid and benzoic acid ointment rubbed into small areas at a time until the whole is covered or by the application of the following lotions immediately following each other

(*a*) Hyposulphate (5 per cent )
(*b*) Acid tartaric (3 per cent )

No attempt has been made to cover all the skin conditions seen in a leprosy institution only certain points are stressed which have proved of practical value and readers when dealing with complicating dermatological conditions are advised to consult standard work on dermatology or to seek the advice of a dermatologist when available

CHAPTER XIX

# A PROGNOSIS

# B CRITERIA OF DISCHARGE AND AFTER CARE

## A Prognosis

The question of the prognosis in leprosy is one of considerable complexity but if in assessing the ultimate outcome of the disease the question of individual resistance massiveness of infection type of disease and race are taken into account it is believed that a very fair picture of the probable course of the disease can be portrayed In a chronic and sometimes mutilating disease such as leprosy it is essential in arriving at a prognosis to take into account not only the possibility of active disease progressing but the amount of present damage or likelihood of subsequent damage In other words a patient with leprosy wants to know what the chances are of his complete recovery without deformity A person who acquires leprosy has in all probability the usual concept of the disease and he imagines the day when he will become useless to society a nuisance to himself blind and crippled and maybe mutilated It would be very unwise to indicate to a patient that he would most certainly recover if taking every fact into account one knew that there was a great likelihood of gross deformity resulting in a few years In other words in giving a prognosis the physician must take into account two possibilities viz

(1) The possibility of the patient becoming an advanced lepromatous case
(2) The possibility of deformities setting in as the result of nerve damage

If the latter eventuality is always kept in mind in patients with marked nerve involvement then the physician will advise that the greatest attention must be paid to the care of the hands and feet and suggest massage preventive exercises and all means possible to postpone such a serious end result The prognosis of leprosy will now be discussed in the light of these introductory remarks

With regard to the neural types in simple macular leprosy this in the case of adults is unlikely to pass into the lepromatous type but the following points must be taken into account

(1) The age of the patient
(2) The extent of the lesions
(3) Clinical appearance of the lesions
(4) The race of the patient

As has been shown only approximately 7 per cent of all children in the Silver Jubilee Clinic Saidapet in the simple macular group have become lepromatous cases during the past seven years Hence the number in adults must be considerably less Therefore it is safe to assume that generally speaking adults are unlikely to pass into the lepromatous stage If however the lesions are extensive the clinical appearance indicates poor tissue immunity and especially if the lepromin is negative then a more

guarded prognosis should be given This is particularly the case in children and young persons and in the European Mongolian and mixed races In fact it is never safe to state categorically for instance in the Anglo Indian with hypopigmented patches that he will never become a lepromatous case for the chances of such a person passing into the lepromatous stage are far greater than in the Indian or African races Therefore when in doubt the patient should be advised when all signs have disappeared or when the lesions have been quiescent and active treatment has stopped to come for examination every six to twelve months

With regard to the question of deformity or the possibility of the patches becoming permanently hypopigmented the following considerations must be taken into account the degree of hypopigmentation and the extent of anaesthesia and nerve involvement In other words the more pronounced the hypopigmentation the less likely is pigment to return this especially applies to the fair person Similarly, the more extensive the anaesthesia especially if pressure sense is impaired the greater the likelihood of permanent nerve damage and the development of trophic signs In this connection it should be remembered that a child is more likely to get disabling deformity than an adult in the presence of extensive nerve damage In estimating the question of permanent deformity resulting it must be borne in mind that the thin fibrosed nerve is of as serious prognostic significance as the thick and oedematous one for in the former the nerve has been reduced to a fibrotic strand while in the latter nerve destruction is not complete and there is still some chance of preventing deformity

Neural tuberculoid leprosy of the minor degree if the lesions are extensive must be looked upon in the same light as the simple macular lesions from the point of view of prognosis It should be added however that the more infiltration the lesions show and the more definite the nerve involvement especially in the presence of a positive lepromin the chances of such cases becoming leproma are negligible It can also be stated that the fewer the lesions the better the prognosis With regard to the question of residual nerve damage and its estimation this is based on the extent of the nerve involvement Again the factor of age must always be borne in mind and a relatively closer watch should be kept on children than on adults with multiple lesions clinically of a minor tuberculoid nature especially if the lepromin is negative

The prognosis of neural tuberculoid leprosy of the major variety is always excellent viewed from the point of view of the likelihood of lepromatous leprosy developing It is our considered belief that true major tuberculoid cases never become lepromatous It might be well in view of the controversy which has arisen to define what is meant by *a true major tuberculoid case* A major tuberculoid case is one with grossly infiltrated well demarcated lesions with a typical histology and a strongly positive lepromin It is our opinion that once well marked tissue immunity has been established as confirmed by biopsy findings and the lepromin test then it is not possible by any known means to break this down and the development of leproma in the case of tuberculoid leprosy would involve this

The question of residual deformity with regard to major tuberculoid leprosy is quite another matter Firstly because of the marked tissue immunity with histological changes extending deep into the corium permanent scarring is very likely to occur Further there is a great probability if not certainty of permanent nerve damage with resultant severe deformity because in all major tuberculoid leprosy of *an extensive* nature the nerve involvement is severe Operation and preventive exercises and electric

treatment will do much to postpone this day and in some instance stave it off for ever It is our experience however that gross damage of the peroneal nerves and facial nerve never recovers and hence with regard to these two nerves the prognosis must be guarded In children the prognosis of tuberculoid leprosy is similar except it must be borne in mind that residual deformity is almost a certainty There is great scope for orthopaedic surgery in relation to nerve damage and deformity in leprosy

We now pass on to the question of the prognosis of lepromatous leprosy It cannot be too strongly stressed that the prognosis in lepromatous leprosy is always grave and in no case should anything but a guarded prognosis be given In arriving at any conclusion concerning the prognosis of lepromatous leprosy the following points



Fig 138 —Diffuse lepromatous leprosy



Fig 139 – Illustrating the serious prognosis of lepromatous leprosy The same patient two years later with marked infiltrative lepromatous leprosy

should always be taken into account The younger the person the more serious is the prognosis The longer a person has had lepromatous leprosy the graver the outlook The prognosis is more serious if the person is a relapsed case and this is in direct proportion to the number of relapses In early lepromatous cases one not infrequently sees recovery but after a relapse the recovery rate is much reduced and it is doubtful if recovery in the sense of freedom from disability or deformity ever occurs after the second relapse The gravity of the prognosis also bears a direct relationship to the occurrence of reactions and in this connection it may be said that whereas a reaction apart from the danger of nerve damage is favourable in the tuberculoid case in lepromatous leprosy it is never favourable for after true lepra reaction the apparent improvement in the patient s condition is deceptive and in reality the outlook is correspondingly worse Another factor which has to be taken into account is race The prognosis is more serious in the European Mongolian or mixed races Curiously enough it is one s general

impression that fewer women tend to be discharged who have lepromatous leprosy than men The last statement is made as a matter of interest for it is believed that it is unwise to draw any conclusions from impressions

With regard to the question of prognosis in relationship to residual deformity while this seldom occurs in the early case the longer the patient has had the disease the more likely will there be residual nerve damage Nerve damage in lepromatous leprosy is due to an interstitial fibrosis and once the fibrou tissue begins to become organised and the nerve fibres are destroyed then little can be done and hence if there is not only loss of tactile sense but loss of the appreciation of pressure sense especially if it is associated with a thin fibrotic nerve then disabling deformity is almost certain to result in the course of time

It should be borne in mind that the presence of any eye lesions is of most serious significance With adequate eye treatment and management a great deal can be done for leprosy of the eye yet this is frequently slowly progressive and in many instances serious loss of sight and later blindness ensues due to the gross changes in the eye Therefore the presence of eye lesions is of grave prognostic significance this is even more so if there are also lesions of the throat

In the atypical intermediate or border line case it is extremely difficult accurately to assess the course of the disease If in the reaction phase prognosis as to recovery is good but it is to be remembered that these atypical types are very liable to end in gross and very disabling deformities Further there is a good deal of evidence indicating that there is a tendency for such cases to become lepromatous after a varying period hence when in doubt it is a wise rule to prognose as for leproma in all intermediate cases

The question of prognosis in neural anaesthetic leprosy remains to be considered In those cases who pre ent themselves with marked deformity bone absorption and trophic ulceration it is sometimes difficult to tell whether they are secondary neural cases or have been neural anaesthetic throughout the whole course of the disease In both the prognosis as to deformity is hopeless for nerve destruction has already caused gross deformity If they have been at any time lepromatous cases then there is still a possibility of relapse While in neural anaesthetic leprosy the chances of becoming a lepromatous case are very slight it should be remembered that the lepromin test is frequently negative and hence there is always a slight possibility that such cases may develop lepromatous leprosy In the early stages the prognosis as to deformity is based on the extent of anaesthesia and degree of nerve involvement but owing to the fact that nerve damage is usually great a cautious prognosis should be given and the patient advised to take the greatest precautions to prevent injury and if slight injuries occur to deal with them at once In addition massage and exerci es and all palliative measures for the prevention of deformity should be assiduously carried out remembering that in neural anaesthetic leprosy the chances of residual deformity are very great

In children and young adults generally speaking the prognosis remains the same Two points must be kept in mind in the non infective group of cases the more indefinite and numerous the lesions the greater the likelihood of the child becoming lepromatous in later life This is especially the case in the incipient lesions of childhood or the pre lepromatous ca e for pre ent investigations indicate that in a period of seven years $33\frac{1}{3}$ per cent of these cases have become lepromatous Further it must also be borne



Fi 140



Fig 141



Fig 14



Fig 143

C se first adm tt l No mbe 1940 d gnosed as an lvan ed l proma On r turn from l n n months l ter ll le ons l ared Con l therefore l proma d gn si l ighly imp bable B op v not s re led an atyp cal se t on Tl e decept n ss of su h ases must be born in min l when test ng out alleged ures f r leprosy

in mind that where nerve tissue is grossly involved then in the growing child the likelihood of gross and disabling deformity is much greater and almost a certainty

In conclusion while it is never justifiable to give a hopeful prognosis when one knows there are few grounds for this neither are we justified in breaking the spirit of the patient by telling him that he will not get better In all simple macular cases and minor tuberculoid with multiple lesions in children a guarded prognosis must be given similarly in lepromatous cases it is wise to be cautious and state that at least six months must elapse before an estimation of progress can be made Remember that all physicians *who have had extensive experience in leprosy have seen remarkable recoveries even in advanced cases* While it must be admitted that the present methods of treatment leave much to be desired it can be claimed that the number of cases discharged prior to the introduction of more modern methods bears no comparison to the number discharged subsequently to this Hope has been given to a class of persons who previously had lost all hope and in this spirit the fight should be continued and possibly some day perhaps nearer than we imagine this scourge will finally be placed among the medical problems which have become solved

One thing is certain those adequately trained are now better able to visualise the progress of the disease and this greater knowledge leading to more accurate prognosis is a great boon to many for if it is realised that much leprosy is as innocuous as a birth mark a great weight will be taken from many shoulders and the general public will *adopt a saner attitude towards this disease*

**B Criteria of Discharge and After care**

The question is constantly arising when should a patient be discharged from a leprosy institution or when can a patient stop treatment ? In connection with the latter part of this statement and in relation to the well known fact that many lesions of leprosy are benign and need no treatment arises the question when does a case not need treatment ? A maxim which should be applied until much more is known about the disease is when in doubt always treat Unless one has had considerable experience it is unwise to withhold treatment in cases which show signs of activity Admittedly many of these in the neural and especially tuberculoid group recover spontaneously but in a disease in which the consequences are so serious every patient has a right to treatment and only those with a really extensive knowledge can afford to refrain from treating any active case Generally speaking however neural cases may cease treatment after they have shown no signs of activity for three months In lepromatous cases the question is much harder to answer there is always a possibility of recrudescence of the disease and unfortunately the relapse rate is still regrettably high It is therefore urged that a lepromatous case should be kept under observation and treatment until he qualifies for a quiescent certificate In children who have become negative the period under treatment should be nine months The question arises when a patient is negative should he continue to live in an infected atmosphere ? There is little evidence of reinfection and for the sake of more adequate observation it is better to keep lepromatous cases in an institution until they are ready for discharge

Should a patient continue treatment after discharge ? This is another question which needs to be considered Unfortunately there is no information on whether a person relapses more readily under treatment than without treatment If a patient wishes treatment then small doses (6–8 c c ) might be given once a week When possible

lepromatous cases should be examined at least every three months and ideally once a month for two years If any bacilli are discovered vigorous intradermal treatment should be reinstituted It seems a reasonable hope that in this way there is a better chance of overcoming a relapse if it is discovered early It must be remembered however that a relapse always increases the gravity of the prognosis

The question of the advisability of a person marrying or not after having obtained a certificate is one which exercises the mind of many people

(a) If the case has been a closed one there is no fundamental objection to marriage if the person is above twenty years of age and he has a quiescent certificate

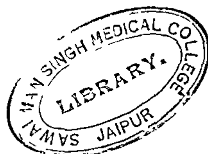
(b) It is not wise for lepromatous cases to marry as the relapse rate is so high As this may be found to be a counsel of perfection open cases should be discouraged from marrying until they have qualified for an arrested certificate and should be watched carefully This principle applies more strictly to women than men for the strain of child birth may be the deciding factor in a relapse

There are many factors which will influence the physician in coming to a decision with regard to discharging a patient from his care In institutions many cases need not be admitted because they belong to the benign neural group On the other hand when patients come as out patients they frequently wish to carry on treatment long after the need for this has ceased Until a more effective method of treatment is discovered this desire on the part of the patients to carry on treatment for life if necessary is understandable While we must endeavour not to create the impression the older writers conveyed in their statement once a leper—always a leper yet we must never view leprosy in a light fashion Leprosy is a serious disease and while it is a well known fact that much of it is innocuous and benign yet a sufficiently serious attitude should be adopted which will on the one hand cause the patient who is discharged to seek advice periodically yet on the other hand not make him feel that he is in the clutches of a malignant power from which death alone will set him free

*After care of Patients*

In the closing chapters of this book the need for welfare officers will be stressed The after care of patients is an aspect which has been sadly neglected While we cannot agree that a world should be created within a world where all who have had leprosy organise an international society with their own currency economic system etc yet Perry Burgess s (1944) suggestion contains a truth which needs emphasising Too often patients who leave institutions are forgotten They pass into oblivion cannot get work and in a few years time may become crippled and useless to society and a burden on the State It is true when the disease has wrought its utmost havoc and a person is no longer able to be an effective economic unit that after care colonies should be estab lished These after care colonies should be able to receive all the help that orthopaedic and neuro surgery can give Each individual should be taught some trade and learn to be a self respecting member of the community In this connection family life should be encouraged and there is much scope for modern Papworth colonies in connec tion with the discharged case of leprosy If an international organisation for the care of the arrested cases and for the preserving of the interests and welfare of the active cases were founded and if Perry Burgess s excellent ideas could be put into practice without the isolation and terror of segregation that his phrase a world within a world conveys it would be a great help to those who owing to deformity or to danger of relapse

cannot be absorbed into society It should however be emphasised that every effort should be made to encourage all discharged cases to resume their place in society unless the possibility of relapse is so great as not to warrant this risk or deformity so disabling as to prevent the patient becoming an effective economic unit All able bodied cases free from infection should return to their *employment without any feeling* of fear or shame Welfare officers should be attached to every institution whose task would be to follow up discharged patients help them to settle in their new environment see village town and business concerns so that work can be found for the discharged case These officers should organise an adequate follow up and after care service If this were done then leprosy would begin to get a fair deal and persons with leprosy would no longer feel ostracised and alone in a hostile world but would take courage and find their place again in normal society When this was impossible owing to deformity or the grave danger of relapse then arrangements should be made for the creation of special colonies where all the resources of occupational therapy would be available and where the citizens of the colonies could make their contribution to the common good of mankind and not feel that they were solely objects of charity This subject opens up vistas of opportunity the possibilities of which can only be imagined It is left to men of good will initiative and determination to follow up such suggestions and create as Perry Burgess has indicated national and international groups which shall resolutely tackle this pressing and urgent problem so that the whole of leprosy may come under the purview of scientific and philanthropic men and our efforts not end at the arrest of the patient s disease






CHAPTER XX

# PREVENTION OF LEPROSY

## General Principles

From time immemorial except for a short period during the eighteenth century leprosy has been considered in some way or other an infectious disease and in almost every country stress has been placed on segregating persons with leprosy. At first every type of leprosy was isolated indiscriminately but since the Leonard Wood Memorial Conference at Manila in 1931 the principle of selective segregation has been more and more emphasised. By selective segregation we mean the isolation of infective cases from contact with healthy members of the community; this can be attempted either by compulsory or voluntary measures. There may be a number of countries in which compulsory segregation is a practical method of controlling leprosy but generally speaking the system of voluntary segregation is preferred because in any country where the leprosy problem is of great magnitude compulsory measures are financially impracticable and force the early infective cases into hiding where they are not discovered until they are no longer amenable to treatment. In the Madras Presidency for example there are probably 300 000 individuals suffering from leprosy so that if only 10 per cent of these were open cases then accommodation would have to be provided for 30 000 persons. The Government therefore has wisely decided that any form of compulsion should only be enforced as a last resort.

It is interesting to note that during the past decade there has been a very marked change in the attitude to prevention in connection with treatment as an effective measure in the control of leprosy. The report of the League of Nations at Bangkok (1930) contains this statement: In the present state of our knowledge the most important line of attack in addition to that by isolation is by treatment carried out by a trained personnel. In fact about this time the following dictum was frequently heard: Treat the early case and cure it; treat the infective case and render it non-infective. It was on this principle that hundreds of clinics were established throughout India. Doubts as to the efficacy of this method of control of leprosy were expressed in the Calcutta Conference of 1933. In the Cairo Conference of 1938 the main emphasis in controlling leprosy was laid on the isolation of the infective case and while treatment was mentioned it was given a subsidiary place and not considered the main weapon in the prophylaxis of leprosy. It is now almost universally accepted that treatment cannot control the disease and that the old adage just quoted no longer holds good because in many early cases the disease becomes spontaneously healed and in infective cases it takes such a long time to render a person non-infectious that for the purpose of prevention such a measure is not effective.

Lowe sums up by saying that it is now generally agreed that it is hopeless to attempt to control leprosy in a community merely by establishing treatment centres.

This emphasises the fact that if an effective system of control is to be organised in any country the policy of strict and indiscriminate compulsory segregation may have to be modified on the one hand and the over emphasis of the treatment centre to the

exclusion of methods of segregation on the other It has been well said in connection with the other human scourge tuberculosis that there was a time when tuberculosis was regarded as a disgrace and the unfortunate victim was ashamed of his affliction Consumption somehow cast a stigma upon its victim The social background was little understood and the public thought that people suffering from consumption were somehow blameworthy (Clark 1933) These words apply in even greater force to leprosy

In our consideration of measures which should be adopted in the prevention of leprosy the principle contained in the above quotation must not be forgotten Too often in the past has leprosy been considered as a social stigma and even in these days of comparative enlightenment the general tenor of many articles on leprosy is that of dealing with a social disease and the whole atmosphere is pervaded with the idea that the medical profession is doing a good but unpleasant piece of work but not related to practical medicine

Medical and lay workers must adopt the whole view of leprosy remembering that what is seen of leprosy by many professional men is only approximately one eighth part of the whole problem while seven eighths is not appreciated because it is seldom brought prominently to the attention of the public There are a large number of preconceived ideas which bear no relationship to facts both as to the prevalence of the disease as well as to its causation and nature For instance while it is true that some of the highest incidences in the world can be found in the Madras Presidency of India it is equally true that there are large tracts in which leprosy is either non existent or of such little significance that it does not constitute a major public health problem Therefore the public health officer must not only have some knowledge as to the clinical vagaries of the disease but must possess a sane and wholesome outlook if there is to be any hope of bringing this age long endemic disease under control

If one had time and access to the growing literature on the prevention of leprosy the tracing of development of modern preventive measures in the various countries would be of extreme interest but all that is attempted at the present time is to review the subject of prevention in the light of experience gained in India and particularly in the Madras Presidency and to lay down certain fundamental principles leaving workers to modify these according to the special circumstances obtaining in the areas in which they are working It may however be of value to summarise the progress of anti leprosy work in India as this affords a good example of the trend of modern development in the prevention of this disease

In every country leprosy work was first undertaken by religious and philanthropic bodies In the Middle Ages in England the Church was the responsible authority for segregating infected persons In India also it has been largely due to the pioneer efforts of the Mission to Lepers and other missionary societies that public opinion has been aroused on behalf of the sufferer from leprosy

In order to value the present work correctly we must review briefly the develop ment of anti leprosy work This work in India was started in the first instance by those having a desire to help a needy section of the community but it was done at first solely on religious and philanthropic grounds with no attempt at eradicating the disease In Europe the Church undertook the task of segregation and control and established lazaar houses outside many large towns In India also leprosy work was first under

taken merely as a work of compassion Very gradually as this work was perceived to be vital to the public health there grew up the belief that institutions would ultimately bring the disease under control The Government partly because it considered it to be a duty to look after destitute persons suffering from leprosy and partly in the hope of controlling the scourge encouraged the formation of settlements throughout India and gave grants towards their support

As a result of this some ninety five leprosy institutions have been established in India ranging from small homes for the housing of crippled cases with little or no up to date medical work to more modern institutions accommodating 700 or 800 patients with growing facilities for dealing with all aspects of the problem The majority of these institutions are owned and managed by the Mission to Lepers which has been the pioneer organisation in stimulating official bodies to assume greater responsibilities for the development of adequate anti leprosy work throughout India In 1924 through the efforts of Mr Frank Oldrieve and Sir Leonard Rogers the British Empire Leprosy Relief Association was founded This organisation was the natural outcome of the work of Dr Victor Heiser and Sir Leonard Rogers and others on the treatment of leprosy The British Empire Leprosy Relief Association has as its object the stamping out of leprosy from the Empire and at that time it was thought that leprosy could be eradicated by treatment alone For the next decade less emphasis was placed on segregation and more on the establishment of out patient clinics etc

It was later gradually accepted that the newer methods of treatment were not producing the results anticipated and that the out patient clinic would fail to control the disease unless associated with schemes of segregation Thus arose the idea (which has never been completely worked out) of village segregation

At present it is felt that the work of the past has been of decided value in that (a) it has kept the problem before the public and has created an interest in leprosy and (b) the more recent propaganda through the out patient clinics has rendered the people of the country more leprosy conscious and has consequently aroused a general desire to do something for leprosy in almost every district It is impossible to state very definitely how far either institutions or out patient clinics have helped to control the disease Out patient clinics treating a few dozen or a few hundred cases but not connected with scientific work contribute little or nothing towards the control of leprosy Institutions in so far as they segregate infective cases and act as centres of training and propaganda are undoubtedly of great value in the general anti leprosy campaign but apart from this it is doubtful whether they can make any adequate contribution to the eradication of leprosy unless they are linked with a comprehensive scheme of prevention

This all shows that the present work has done much to prepare the public mind for more active steps In so far as institutions segregate infective cases and protect others (especially children) from contracting the disease their work is of great value Moreover the power of the example shown by the workers in institutions in caring for the destitute the incapacitated the helpless and the ostracised cannot be computed It is a contribution which must enrich a nation

It will be seen that up to 1935 as far as the Madras Presidency is concerned all that had been accomplished was to create a general interest in the problem but there had been no attempt to organise an adequate system throughout the province with one authority acting as a central control co ordinating activities and building up an

organisation which would ultimately cover the whole country In other words if leprosy is to receive a rightful place in the scheme of preventive medicine an adequate leprosy service must be created in which officers have the same standing chances of promotion emoluments and prestige as in any other departments of the Government The officer in charge of such a service should be a senior administrative officer with special leprosy experience and directly responsible to the head of the medical services Only in this way can adequate attention be given to the problem and can any hope be held out to bring this disease permanently under control

While making a plea for dealing with the whole problem of leprosy there is no desire to create the impression that leprosy should be emphasised out of all proportion to its importance as an endemic disease If leprosy is shown to be of minor importance in a country or district then no official measure may be necessary If as has been emphasised leprosy is looked upon as one of the endemic diseases for which preventive measures are necessary and divested of much of the false notion surrounding the subject then an adequate preliminary study of the disease will be made and measures taken which will be in proportion to its importance as an endemic disease

As has already been indicated the work in the Madras Presidency especially during the past ten years has been developed along such lines so that the Government has gradually come to recognise its responsibility for the leprosy work and has adopted a comprehensive anti leprosy policy In preparation for this the British Empire Leprosy Relief Association (Madras Provincial Branch) encouraged the creation of special investigation centres and as a result of this work the Government has now adopted the principle laid down in the Cairo Conference Report thus accepting the statement contained in the Government of India s Report on Leprosy and its Control in India (1942) that the development co ordination and carrying out of a comprehensive leprosy programme is their inescapable responsibility In order therefore to indicate methods of prevention which we feel will ultimately bring this disease under control the plan for the leprosy campaign in the Madras Presidency will be described and we hope this will provide the basis on which schemes for leprosy prevention in other countries can be developed It must be borne in mind that any system which is established must always take into consideration local conditions as to customs education availability of adequate medical personnel etc Principles however remain it is details which must be modified to the precise situation which is found in the country or district in which leprosy work is to be organised

In organising an adequate leprosy campaign it is an essential prerequisite that leprosy should be looked at both from the point of view of treatment as well as prevention as an ordinary medical disease and except where special measures are necessary be treated in the wards of the general hospital In this connection Cochrane (1944) has stated that it is of interest to note that the routine treatment of leprosy is now accepted by the authorities as a proper function of the general medical service of the Madras Presidency and that it is now agreed that if a patient has leprosy he has as much right to receive treatment at a general hospital as has a person suffering from tuberculosis cancer or syphilis Therefore at all government and mission hospitals and at Local Fund dispensaries treatment for leprosy should be available If the number of cases warrants it a special clinic should be organised but all clinics which are primarily for the routine treatment of the disease should be and in Madras generally speaking are under the control of the District Medical Officer (Civil Surgeon)

A further advance in the preliminary organisation of the leprosy campaign in Madras was made when an order from the Surgeon General's department was issued making it incumbent upon all district hospitals to admit patients suffering from leprosy who require immediate medical or surgical treatment either for diseases other than leprosy or for acute complications due to leprosy It is advised that these patients should be admitted into the septic or infectious diseases wards if infective or septic and into the ordinary wards if not infective It will take some time before the average hospital will accept this principle but not until a patient with leprosy receives the same attention as a patient with tuberculosis syphilis or any other chronic disease will the general public be convinced that persons suffering from leprosy are any more than objects of charity and of Christian mercy Do not let there be any misunderstanding in a well organised leprosy campaign there is this aspect of work The Mission to Lepers and all workers in institutions which care for the crippled have set a noble example the value of which cannot be computed but unless a sense of proportion is maintained and the work related to the whole medical problem then no headway will be made

Further before leprosy can receive the attention it merits a much greater emphasis must be placed on its teaching in Medical Colleges in countries where it is prevalent In every teaching hospital adequately equipped and fully staffed leprosy departments should be set up and a series of lectures and practical demonstrations should be arranged Attendance at these should be compulsory for all medical students These lectures should ideally be not less than eight with eight demonstrations and should briefly cover all aspects of leprosy and their aim should be to endeavour to show that leprosy is a scientific branch of medicine as important and as entrancingly interesting as tuberculosis and a subject worthy of research of the highest grade Only when medical students realise that their teachers are as keen on teaching leprosy as they are on teaching tuberculosis syphilis or any other special branch of medicine will they take an intelligent interest in the subject Towards the attainment of this end questions should be occasionally set in the pathology medicine ophthalmology and even in surgical papers Then and then only will medical students be convinced of the importance of leprosy as an endemic disease in countries where it still remains a serious problem

It must be borne in mind that practitioners have seldom or ever had adequate instruction in leprosy and therefore adequate post graduate courses should be planned This all means the appointment of specialists to organise a teaching programme in leprosy but in modern medicine the services of a specialist in leprosy are as important as the services of specialists in tuberculosis syphilis or any other disease which may be of endemic importance in a country

It is our belief that leprosy is a disease which should be possible of control Unless governments are willing to set aside sufficient finance and make available an adequately trained medical personnel and to establish sufficient leprosy prevention units linked to institutions and treatment centres the control of leprosy will ever remain a pious hope It cannot be too often reiterated that half hearted measures are of little value in dealing with this disease An age long problem such as leprosy demands the attention of the best qualified in the profession and an expenditure of money far greater than the average Provincial or Colonial Government has up to now been prepared to face

All this means that in future leprosy workers must be paid salaries comparable to other research workers and doctors of similar grade of training and experience It

has been realised for some time and was strongly emphasised in the Report on Leprosy and its Control in India (Central Advisory Board of Health 1942) that leprosy cannot be controlled by treatment Therefore treatment will play only a limited part in the campaign and thus it will be understood that a leprosy policy based mainly on the establishment of out patient centres can never be successful It should be stated lest the position be misunderstood that treatment is of value for three reasons

(*a*) In certain types especially the early lepromatous variety it is believed that not only is treatment beneficial but all the evidence at present available indicates that the earlier and the more intensive the treatment the greater is the chance of recovery

(*b*) By making treatment available patients are more ready to submit to the necessary preventive measures

(*c*) Many cases can only be kept under observation by regular attendance at a treatment centre (Cochrane 1944 )

CHAPTER XXI

## PREVENTION OF LEPROSY—*continued*

WITH these introductory remarks we pass on to the more detailed description of measures for the prevention of leprosy In every country where leprosy is prevalent there are institutions for the isolation and care of patients with leprosy but before the management of these can fit into an overall plan of leprosy control a great deal of preliminary work usually needs undertaking It is generally accepted that the two most effective methods of leprosy control are

(1) The segregation and treatment of infective or open cases

(2) The prevention of child leprosy

Before measures can be organised on a nation wide basis however it is essential to have

(1) Information as to the extent of the problem

(2) Sufficient institutions of various kinds to deal with all aspects of the disease

(3) A trained personnel both medical and lay to implement the policy laid down

(4) Legal powers to enforce any regulations which may be considered necessary to put into effect measures adopted for the control of leprosy We shall now discuss these points in some detail

### I INFORMATION AS TO THE EXTENT OF THE PROBLEM

In countries where leprosy presents a problem it may be difficult to decide where control measures should be enforced General control measures unless the problem is a strictly limited one are not likely to succeed for it is a well known fact that leprosy is not equally serious in all districts and therefore it is only in those areas where the disease presents a public health problem that it is essential to organise extensive control work I indicated as far back as 1933 in a report to the Government of Ceylon that information concerning the number of cases of leprosy without details with regard to age type etc might give no adequate information and cause health authorities to concentrate on the wrong areas

Reviewing the leprosy situation as a whole it will be found that there are areas sometimes villages contiguous to other highly infected areas or villages in which the incidence of leprosy is negligible On the other hand there may be areas where leprosy may be prevalent but is not serious enough to warrant taking active measures whereas there may be still other areas or villages where not only is the incidence of the disease high but leprosy is actively spreading In a country with a high leprosy endemicity it is manifestly impracticable to deal with the whole problem and therefore it is contended that by concentrating measures on areas where the disease is actually spreading leprosy will be brought under control more quickly than by trying to cope with

the problem as a whole This raises the question how is it possible to find these areas?

In every country where leprosy is a serious problem there should be appointed a medical specialist to direct the leprosy campaign The director of the leprosy campaign should be responsible to the head of the medical services and it is he who would ordinarily advise the Government as to the areas in which active anti leprosy measures are necessary This means that attached to the office of the leprosy campaign should be a survey personnel who would under the director gather together all information concerning the existence of leprosy in a given district and proceed to alleged highly endemic areas to investigate whether active measures need to be taken

Leprosy is usually so widespread in countries where it is prevalent that it is impossible to undertake measures of relief which will deal with every district or area where there are cases Even in a single district only such cases as are an actual or potential danger to the public health can be dealt with and therefore it is essential to be able to estimate whether the problem in a given locality is serious or not It is therefore important to gather information about the general incidence in a district prior to the organisation of more intensive surveys and preparatory to the development of more detailed plans for bringing leprosy under control A very general idea of the distribution of leprosy can be acquired by the following methods

- (a) Examination of school children
- (b) Examination of registers in out patient clinics
- (c) Examination of representative groups in a given area

### (a) Examination of School Children

Where school attendance is either compulsory or where the population are school conscious then this is probably the most practical method of estimating the relative importance of leprosy in a district In the first place it is comparatively easy to ensure the examination of a large percentage of children In this connection it is better to train the ordinary school medical officer to undertake this examination at a time when the routine physical examination of children is being conducted rather than arrange a special examination for when this is done there is a tendency for parents to persuade their children whom they know to be suffering from leprosy to absent themselves Further if this is done leprosy is related to the other endemic diseases liable to occur in a school and not specially emphasised Such an approach helps to bring the disease in the eyes of the teacher and public into its right perspective The name and address of all children should be taken and whenever cases of leprosy are discovered the school medical officer or an adequately trained assistant should make arrangements to visit the homes of the children so detected

### (b) Examination of Registers in Out patient Clinics

While out patient centres by themselves as stated contribute little or nothing to the control of leprosy yet useful information can be gathered from an examination of their records for they should show the number of cases which have been registered over the years their type and the village or street from which they come In this way a comparison can be made of the relative intensity of infection between one village

and the next Unfortunately except in cases where the doctor in charge of a clinic happens to have enough experience the record of the type of case attending the clinic is not as a rule accurate enough on which to pass any judgment with regard to the relative numbers of each type coming from the areas served by the clinic Nevertheless the majority of out patient clinics in India give sufficient information to serve as a comparison between the number of cases coming from the various areas rural or urban in the district

## (c) Examination of Representative Groups in a Given Area

Where recruits to the army or police force are examined valuable information can be obtained provided the medical officer is sufficiently interested and trained to recognise the disease for generally speaking recruits come from all over the country and it is reasonable to suppose that if leprosy were endemic in a given area a larger proportion of recruits from such a locality would be discovered to have leprosy This method is of limited value for as the result of experience in the war (1939-45) it was remarkable how frequently early cases were missed among recruits

Sometimes if leprosy is reported to be prevalent in a certain area by making friends with the headman or village munsiff a preliminary investigation can be undertaken by an examination of the crowd which always gathers round when a fresh visitor arrives This examination should start with the more friendly disposed persons and gradually the majority of the crowd will join in the fun of the game Every area roughly surveyed *should be marked on a map so that the distribution of open and closed cases can be seen* at a glance If preliminary information of the incidence of leprosy is gathered in this fashion gradually the rough outline of the distribution of leprosy in a given area will shape itself The next stage in the campaign is to establish one or more survey parties to undertake the intensive survey of villages in each district in which leprosy is prevalent For instance in the Madras Presidency apart from the suggested field personnel attached to the director s office there will ultimately be formed ten survey parties whose head quarters will be in the headquarters town of the district and whose responsibility will be to investigate all information indicating that a given town or rural area has a high incidence of leprosy Admittedly in a country like India if such a policy were developed for the whole country a very large organisation would be necessary but each province is so large a territory that it must be considered separately and if leprosy is to be adequately dealt with there is no other way by which to secure the necessary information The following is the minimum personnel required for a survey party

One field investigation medical officer
One clerk
A nurse or health visitor—it is essential that this person be a woman
A peon or messenger

The object of an intensive survey is to obtain as exact information as possible concerning the state of the epidemic of leprosy in a given district in order that it can be decided whether active measures are needed to control the infection As yet there has not been worked out a leprosy index by which the situation may be gauged at a glance As a result however of continuous field investigation it is hoped that the intensity of infection may ultimately be represented by a standard formula so that one area can be easily compared with another

At present we consider the following criteria are of maximum importance in determining whether leprosy is a serious endemic disease

(1) Gross incidence i e number of cases of leprosy per thousand of the population examined
(2) Child incidence i e number of children with leprosy per thousand children examined
(3) Open case rate i e number of open cases per hundred cases of leprosy
(4) Child rate i e number of children with leprosy per hundred cases of leprosy
(5) Sex ratio i e ratio of male to female cases in the area based on the sex incidence (number of male and female cases per thousand of the population)
(6) Age group distribution i e number of cases in the various age groups (0–14 15–34 35 and above)

It can be stated until more accurate information is acquired that if the gross incidence in the Madras Presidency is above 30 per thousand and if the child rate is 30 per cent or above and the open case rate 25 per cent or above the situation may be serious [1] This opinion we think would tend to be confirmed if in addition the ratio of males to females had altered from the usual three or four males to every one female to two males or even less to every female infected and further if the distribution of the cases in the various age groups showed a greater percentage of cases in the 0–14 and 15–34 age groups than in those above 34 It is not the number of cases in a given area that necessarily matters it is the percentage of open cases and child cases linked with the age group distribution and the sex ratio that appear of greater importance It is manifestly impossible where leprosy is widespread to undertake measures of active prevention in every area Therefore the areas of greatest importance are first chosen and as the disease is controlled in those areas or villages the areas of less importance are subsequently dealt with this means the constant utilisation of the survey parties which can be looked upon as active patrols continuously investigating the enemy s position so that headquarters can so dispose of available forces so as to check enemy movement wherever it becomes active All this involves reasonable accuracy in survey methods and necessitates the examination of every man woman and child in the area chosen for intensive survey Details of methods of survey have been laid down in the Report of the International Congress of Leprosy held in Cairo (1938) as well as in the Report on Survey published by the Indian Research Fund Association (1941) Those organising anti leprosy work are advised to consult these publications

The pioneer in survey work in India is Dr Isaac Santra whose detailed methods have been largely adopted for the Madras Presidency In the appendix to this chapter several sample surveys are given to indicate the method adopted and to illustrate the basis on which conclusions can be drawn

A word should be added with regard to the scheme originated by Muir (1929) designated by the name P T S —Propaganda Treatment Survey—and reasons given why it has not been recommended The plan consisted of a survey party visiting an area carrying on propaganda establishing a treatment centre and simultaneously undertaking a survey This method has several disadvantages (1) In the first place

[1] The incidence and proportion of the various types of cases and of child infection vary so greatly that officers in other countries will of necessity have to make their own estimation as to the relative significance of the incidences and ratios in the areas surveyed

propaganda is largely based on the effectiveness of treatment—this is considered unsound (2) The establishment of treatment centres gives support to the older conception that leprosy can be controlled by treatment (3) When the survey party leaves no permanent preventive scheme is left and the treatment centre gradually loses its popularity and any good that it may have done tends to be nullified by the subsequent disappointment consequent on the failure of treatment as a whole

## II SUFFICIENT INSTITUTIONS OF VARIOUS KINDS TO DEAL WITH ALL ASPECTS OF THE DISEASE

It cannot be too strongly emphasised that without well organised institutions a balanced system of leprosy control is impossible to develop Institutions of various



Fig 144 —M in nt an e Lady W ll ngdon Lep o y S n t um
(Ph k by H L R H L j)

kinds will always have a place in the leprosy campaign and it is hoped that the day when *organised institutional work is considered superfluous* has long since passed such a viewpoint may have been understandable in the first flush of enthusiasm on the introduction of the newer methods of treatment but now that the work of the past twenty years can be more accurately appraised there is no justification for adopting such a point of view Institutional work will be considered under the following heads

(1) Leprosy sanatoria
(2) Leprosy colonies
(3) Children s sanatoria
  (a) For children with leprosy
  (b) For healthy children whose parent or parents have leprosy
(4) *Homes for advanced and crippled cases*
(5) After care colonies

**(1) Leprosy Sanatoria**

The following description of the organisation of a leprosy *sanatorium* has been kindly furnished by Dr Donald Dow lately medical superintendent of the large leprosy hospital founded by the late Dr Isabel Kerr at Dichpali in the Nizam s Dominions South India

A modern leprosy institution should be a combination of hospital and sanatorium i e it should have hospital accommodation for patients suffering from complications of leprosy or co incidental diseases and it should have cottage accommodation for patients who are not bed ridden and who can do some form of work

Such institutions should not be in proximity to towns They should have sufficient space to allow of development and avoid overcrowding and there should be a considerable area of land devoted to agriculture Water supply should be adequate Leprosy sanatoria should not be so small that they lack an all round life and are not economical nor should they be so large that all personal touch is lost Admissions should be on a voluntary basis [1] and apart from neural cases which may require some special form of treatment (operation, electricity etc ) the patients should generally be composed of lepromatous cases

*Buildings*

These should include ward accommodation operating theatre buildings for routine and special treatments laboratory—these are the hospital buildings the residential accommodation should consist of cottages which are well ventilated and so constructed that they can be kept clean—the quarters for men women and children can be located in different parts of the compound administrative block—this will vary in size according to the size of the institution buildings required for farm work educational and industrial activities and for concerts meetings etc There should also be adequate sanitary arrangements

*Food*

It is essential that patients be supplied with a nutritious diet and the practice of supplying grain and a cash payment to purchase the additional food stuffs required is not satisfactory The diet should be under medical supervision and should satisfy the demands of nutritional experts *The most satisfactory way of doing* this is to issue food from a central kitchen as is done in general hospitals An institutional farm can be of great help in supplying vegetables fruit milk grain etc for kitchen use

*Labour*

Occupational therapy is a very important adjunct of medical treatment in leprosy and the type of work should be useful to the institution and according to the capacity of the patients Many forms of work can find a place in the organisation and they will vary according to the size of the institution and its locality so the following list is only tentative The various sections are controlled by a technical expert on the

[1] The principle of voluntary admission is accepted except under special circumstances these are indicated later—R G C

staff but the work is performed by gangs in charge of an elder (patient) who is responsible for seeing that the expert's orders are carried out

(a) *Farm* Field and garden work attending to animals
(b) *Kitchen* Cooking for women various tasks can be done by men
(c) *Hospital* Older boys and girls can work in wards and give injections
(d) *Trades* Men may serve as carpenters weavers builders etc
(e) *Education* Educated patients can give valuable help in children's school
(f) *General* Men can clean roads do anti malarial work etc Women can wash and mend children's clothes



Fig 14 —Panoramic view of the Lady Willingdon Leprosy Sanatorium Chingleput South India

No payment should be made for labour but patients should be taught it is a privilege to render service of value to their community [1]

*Social Life*

A sanatorium is a very self contained unit and provision should be made for (a) games and sports (b) concerts and dramas (c) lantern lectures and cinema shows (d) meetings and services

*Law and Order*

It is very essential that discipline should be maintained but it makes for greater happiness and contentment if the patients feel that it is not an imposition from above but something in which they have a share This may be accomplished by having

(a) *Periodic Election of Elders* They should hold office for a limited period and

[1] Some institutions give a small wage which helps the patient to get the little extras which are so appreciated in institution life —R G C

be responsible for seeing that their living quarters are clean and tidy that patients regularly attend for work and do the allotted tasks that irregularities are reported for trial and penalty

(b) *Regular Courts for Trial* The court should consist of a chairman who is a member of staff (e g teacher) and there should be a jury of elders who will not only return a verdict but give their ideas on punishment This system is very satisfactory in practice and means that the administrative head of the institution can content himself with occasionally reading minutes of trials and seeing that there are no miscarriages of justice

*Staffing*

We have left a consideration of staff until the end not because it is of minor importance but because by first describing the various activities of a leprosy colony it will be evident that a team of workers with some sense of vocation is required Success or failure is largely dependent on the spirit in which the work is done and it must be remembered that patients are frequently suffering from a psychic trauma which demands sympathy and understanding The following is an outline of the staff required and their responsibilities

*Medical Superintendent* As in mental hospitals and tuberculosis sanatoria the administrative head should be a doctor He should be responsible for

(a) carrying out the policy of the Government Department or Committee of Management
(b) seeing that all members of staff perform their duties
(c) discipline of staff and patients
(d) allocation of duties to subordinate medical staff
(e) directing medical work also educational work in leprosy for doctors and students
(f) advising authorities on leprosy problems

*Business Manager* He is the right hand man of the superintendent and should undertake

(a) responsibility for office routine
(b) see to buildings and repair work
(c) have supervision of work of various technical experts

*Medical Officers* They will carry out duties as directed by the medical superintendent

*Nursing Sisters* They should have oversight of ward work injections operations linen and all that pertains to the duties activities and responsibilities of a nursing sister

*Teachers Agriculturist Tradesmen etc* They have the direct oversight of the work in school farm etc and report as required to the business manager

Regular staff meetings should be held and reports made and suggestions received In this way the unity of the institution is achieved and the co operative spirit which makes for smooth running maintained

**(2) Leprosy Colonies**

In countries in which more primitive conditions exist leprosy institutions can be organised on the system of a colony This is particularly suitable in Africa where

whole villages are organised in the form of a colony and where patients live as normal lives as circumstances permit *In such colonies patients live in huts and there are* special hospitals and infirmaries designed for those who need medical care or who are crippled Under such a syst m and in more primitive countries it should be possible to make a colony at least as far as food is concerned self supporting It might be said in passing that it is doubtful whether a properly organised fully staffed and equipped colony could ever be truly self supporting and therefore agricultural and other pursuits should be looked upon as forms of occupational therapy helping to provide *all or part of the food and keeping the patients happy and contented Much work has* been done in the organisation of large colonies especially in Africa where the system



F G 146 —Panoram c w of th L dy Willingdon Lep sy Sanat um Chin l put S uth India

of clans and headmen lends itself to such attempts at control The question of marriage must be considered in the organisation of colonies on the clan or tribal basis for unless this is permitted it would be impossible to consider such a method of control In leprosy sanatoria and hospitals so long as compul ory segregation is not enforced and patients present themselves voluntarily it i we feel better to discourage marriage this is particularly the case under Indian conditions

**(3) Children s Sanatoria**

(*a*) For children with leprosy
(*b*) For healthy children whose parent or parents have leprosy

(a) *For Children with Leprosy*

With the increasing emphasis on leprosy in children the question of sanatoria and other types of institutions for child leprosy is receiving greater attention When

the question of methods for the control of rural leprosy is discussed in the concluding chapter it will be mentioned that it is impossible to segregate children under village circumstances and therefore it is a prime necessity to send all children with infective or potentially infective leprosy including those who have or are likely to develop gross nerve damage to a children s institution Such a sanatorium may be part of an existing institution or a separate institution altogether as for example the Children s Leprosy Sanatorium in Ettapur Salem District South India In the organisation of such an institution the policy with regard to admissions should be carefully thought out All children who are infective or potentially infective should receive preferential admission Early benign lesions likely to retrogress in the ordinary course of the disease should





FIG 14 —General view of hospital Lady Willingdon Leprosy Sanatorium
(Ih t bl B L F tl Eq)

be kept under observation in the environment in which they live for unless it is essential to admit a child either because it is infective potentially infective or in danger of becoming deformed or actually has nerve damage then it is far better to permit him to carry on under normal circumstances for only in this way can a right appreciation of the disease be conveyed to the general public Under these circumstances it will be seen that children s sanatoria should be thoroughly equipped to teach children and to train them to be useful citizens Unfortunately lepromatous leprosy in children is of serious prognostic importance There is a grave likelihood of a child passing into adult life with lepromatous leprosy When a child has reached the age of sixteen he should be transferred if still infective to an adult institution

The child crippled with leprosy is a most pathetic figure and therefore in all children s sanatoria a section should be set aside for such cases and this section should have specially trained personnel to deal with orthopaedic surgery occupational therapy and physio therapy and in addition there should be a rehabilitation centre As far

as is known no child leprosy sanatorium is so completely equipped as this The child is the most precious heritage of the nation and to us who know the wastage of life caused by leprosy the sadness of the little one who has fallen by the way on account of leprosy comes as a challenge to endeavour to see that no child suffers acute physical or mental torture through the ravages of leprosy A vista of enormous possibilities opens up for child leprosy awaiting the pioneer who will answer the cry of the child who through no fault of his own has acquired leprosy

(b) *For Healthy Children whose Parent or Parents have Leprosy*

Generally speaking all healthy children should be brought up in their own environ



Fig 148—Main hospital ward Lady Willingdon Leprosy Sanatorium
(*Photo by B L [illegible] Esq*)




ment and not in an artificial atmosphere For if they are placed in such an institution they become divorced from the life of their community and are liable to become institutionally minded with the resultant psychological problems which tend to arise in children who have become homeless Nevertheless it is a fundamental axiom that the children of parents with infective leprosy should be separated preferably at birth and certainly at as early an age as possible from their infective parents It is more reasonable to remove the source of infection to an isolation centre than remove the child and in India this frequently can be done for there are usually relatives able to care for the child While the segregation of healthy children of parents with leprosy has been rightly stressed it must be remembered that possibly as many children acquire leprosy from relatives other than parents than do the children of the infective case On page 21 a table is given showing that children in South India are infected from sources other than their parents more frequently than from the parents themselves and therefore not only the healthy child of parents with leprosy must be taken into account but all

children must be considered Let me not be *misunderstood* there *is* great scope for healthy children's homes so long as every effort is made first to remove the source of infection rather than the child then if this cannot be accomplished the child must be separated from the infective *person in a suitable home Space does not permit* to enlarge on this subject but to undertake such work raises the question not only of the child of school age but the infant who must be cared for in a nursery the toddler and the young adolescent This is *a problem of much complexity and should* be handled by a specially trained personnel Questions such as reabsorption into the community marriage and training for a career professional or otherwise all have to be considered in the setting up of *special institutions for healthy children of parents* with leprosy



Fig 149—Operating theatre main hospital wards
*(Photo by B I R [illegible])*



### (4) Homes for Advanced and Crippled Cases

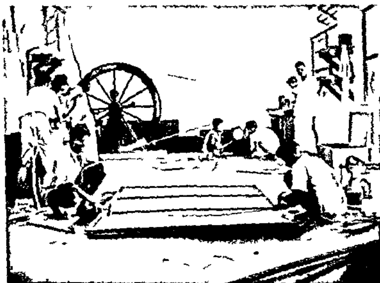
Cochrane (1944) has recently indicated that the problem of crippled cases falls under two heads

(*a*) Those who have become crippled *through failure in treatment*
(*b*) The persons who beg because their deformities are a possible source of income

It is recognised that even with *modern methods* of treatment 60 to 85 per cent of all persons who suffer from lepromatous leprosy do not recover sufficiently for them to return to work and the great majority of these remain infective It may be said with *regard to advanced cases that the medical profession* has little appreciation of the difficulty of caring for these particularly the advanced lepromatous patients who may be blind badly ulcerated and crippled These cases not only present a very *difficult* problem in nursing but they usually *remain* infective all their days The still commonly accepted opinion that the average life of a lepromatous case is ten years needs to be



Fig 1 0 —Occupat onal tl apy—weaving
(Ph t ty F I R tt F q)



Fi 151 —O up ti nal th py—c rpent y
(Ph t by R L F tt I sq)

revised In fact it is our belief that lepromatous leprosy does not unduly shorten life for the expectation of life is frequently as high as that for the country in general If this then be the case the time has come to consider the question of infirmaries for such cases All institutions for the isolation of leprosy should include in their plan an infirmary section The nursing and care of the advanced case is a constant tax on the staff of the institution These infirmaries should be separate from the main institution but should be an integral part of it and special arrangements made to facilitate the nursing of such cases a suitable staff and equipment should be provided for the care of the bed ridden In such infirmaries proper bathing cooking and toilet facilities should be available Apart from the humanitarian side of the work there is a great deal of investigation yet to be done in advanced leprosy The arrangements



FIG 15 —Social activities Patients acting an Ind an drama
*(Photo by I I Ri it Esq )*

for caring for the deformed and advanced case lag far behind the need and no modern state should tolerate the position now seen in some countries

The beggar with *leprosy should not be specially selected for discriminate treatment* This situation can only be met by approaching the problem of mendicancy as a whole This is largely an urban problem which has never been taken up in a comprehensive manner As far as possible beggars should not be treated as criminals Where there is evidence that an individual or individuals are making their livelihood out of this unfortunate class of person then they should be severely punished Arrangements should be made for the care and permanent housing of all persons whose economic condition is such that they cannot maintain themselves without resource to begging Institutions of this kind should be staffed and managed by a philanthropic organisation which is experienced in this work If facilities for the voluntary care of these persons are available then all those who refuse to isolate themselves in such homes or escape

should then be treated as trespassers against the law and be incarcerated in a prison In these beggar homes facilities should be given for the separation of infective cases of leprosy but no person with leprosy who is non infective need be specially separated from the general class of beggars

### (5) *After care Colonies*

This is an aspect of the work which should receive increasing attention While the general principle should be adopted that persons who have recovered from leprosy should under normal circumstances be reabsorbed into society and every effort should be made to emphasise that this is to be expected there will always be a certain number of persons who may find that it is impossible to earn an economic wage and by virtue of the fact that responsibility has been accepted by the authorities through their admission to a leprosy institution provision must be made for their future care This specially applies to those cases which are deformed or are likely to have a serious relapse if returned to an unfavourable environment The creation of after care colonies would open up the way for employing young people who had been brought up in homes for healthy children or who had been discharged from children s leprosy sanatoria

## III TRAINED PERSONNEL BOTH LAY AND MEDICAL, TO IMPLEMENT THE LEPROSY CONTROL PROGRAMME

In the concluding chapter detailed methods of prevention in rural and urban areas and the relationship between the several units and the whole control organisation will be indicated but before the complete leprosy control service is established an adequate number of trained workers both lay and medical must be available and therefore the matter of the organisation of training courses not only for the specialist but also for lay workers must be considered

One of the greatest handicaps in the organisation of the leprosy campaign is the lack of realisation among the medical profession that leprosy is primarily a medical and public health problem and secondarily a social one While directors of medical and sanitary services are fully cognisant of the necessity for undertaking active control measures in malaria plague sleeping sickness and other communicable disease generally speaking their approach to the leprosy problem is elementary in the extreme The reason being that in schools of tropical medicine the modern aspects of leprosy are not given sufficient emphasis It is therefore imperative that training in leprosy should start in the medical school in countries where leprosy is prevalent and the whole course of training in schools of tropical medicine should be drastically overhauled Cochrane (1944) states as follow

Every medical college in areas where leprosy is an important endemic disease should have a separate leprosy department in the charge of a physician who has higher medical qualification The department should work in close association with that of dermatology but leprosy should not be considered merely as part of dermatology for then it would be given scant attention Where leprosy is not an important disease in a province then it may be considered along with dermatology but the lecturer should himself have taken an advanced course in training The prevailing opinion that a fortnight s course in leprosy qualifies a person to become a

leprosy expert should not be encouraged A disease which has baffled mankind for centuries cannot be mastered in fourteen days!

Post graduate teaching in leprosy should cover the following courses

(1) Elementary (2) Advanced (3) Refresher (4) Specialist

**(1) Elementary Courses**

These need not be for more than fourteen days duration and all practitioners should be encouraged to take at least this course

**(2) Advanced Courses**

These should be open to all who have taken the elementary course and wish to have a fuller acquaintance with the subject and should be of a month s duration All persons in charge of out patient leprosy work should be encouraged to take this course as a very minimum

**(3) Refresher Courses**

These should be for senior medical officers health officers and school medical officers and of ten days duration The object of such an abridged course is not to train specialists but to give district medical officers and those in administrative positions up to date information so that they may be able to take a greater interest in the treat ment and prevention of leprosy Too often a leprosy clinic is established and a junior doctor is placed in charge and the medical head of the district is unable to encourage or help because he knows very little about the subject If such refresher courses as indicated were available the doctor in charge of the routine treatment of leprosy would receive encouragement and help and leprosy treatment would become an integral part of the out patient department of a district hospital and not relegated to a shed in the back of the compound and given the minimum and scantiest attention Health officers should be encouraged to take this course so that they too may be in a better position to co operate in any leprosy campaign

**(4) Specialist Courses**

These should be for those who intend to specialise in leprosy and should be of six months duration at least The course should cover all aspects of the problem including the practical working and management of an institution Such a compre hensive course should be taken by those who are in charge of leprosy institutions survey units teaching departments and any special investigation units Only thus will men of adequate calibre be attracted

**Courses for Lay Workers**

In the development of the leprosy campaign the lay worker must not be left out of consideration his value has been demonstrated in the many laymen who are superintendents of leprosy homes and in Africa where under the auspices of Toc H lay workers have done invaluable work Attached to every institution and to the main leprosy departments of colleges and headquarters hospitals should be one or more lay workers whose duties would be to take a personal interest in all patients study their environment encourage them to persist in treatment and advise them to take precautions if infective He would also endeavour to find means of assisting the family

if the bread winner had to be admitted into a leprosy sanatorium and follow up contacts and discharged cases endeavouring to see how the discharged case is standing up to work outside and how he is being received into the general community There are innumerable ways the lay worker could help to bridge that gap which is at present altogether too great between the doctor who is doing what he can medically and the lay public or patient who through ignorance folly or deliberate carelessness undoes all the work which is being built up not only to create a right attitude towards leprosy but to help to stop the ravages of a disease which has blighted the lives of mankind for centuries and only now is beginning to receive rightful attention To some it may appear that we are overstating the facts but inquiry at any out patient leprosy department or taking a random selection of patients in any sanatorium will reveal a grim tale of sadness the like of which is difficult to find elsewhere It is the gaunt spectre of prejudice persecution and fear which must be laid low It is to the educated enthusiastic lay worker the challenge is issued for it is he who can best convince and help the public to understand that leprosy is not a visitation of the gods but as all disease an accident of life that human beings are not merely outcasts objects of pity and compassion but ordinary citizens many of whom can still carry on others of whom should be protected and cared for not as if they were unclean but as honourable casualties in the grim battle against disease To those who hear the call to work as welfare officers and lay workers there is no George Medal or Victoria Cross but the satisfaction that their fellows shall be saved from blight and stigma and helped to raise their heads among men as those who are not ashamed but are honoured as soldiers are honoured who have fought well and bravely and have become severe casualties in the battle against disease One day in God s own time we shall celebrate V L day (VICTORY OVER LEPROSY) but till then let us not grow weary but pursue this warfare until not only leprosy as a disease is controlled but all the horror and unreasoned fear that accompanies it is banished for ever from the mind of man

## IV LEGAL POWERS

In any comprehensive anti leprosy scheme the part legal powers should play in helping to enforce measures needed to be devised for the prevention of infection should be considered A fundamental principle must be laid down that while regulations at times have to be devised for the protection of healthy members of the public especially children on no account must the force of law be used so that sufferers from leprosy are branded as criminals and worthy of punishment One only needs to compare the attitude towards the mentally afflicted to day and twenty or thirty years ago and if the legal aspect in leprosy is reformed to the same extent as that in mental disease a great step forward will have been taken In this connection it should be stated that it is not only unnecessary but unjustifiable and cruel to institute legal powers against all cases of leprosy irrespective of the type Secondly it creates a great sense of frustration if those who can protect themselves from infecting others—and as will be seen the precautions are very simple—and have power to do so are summarily incarcerated in a leprosy institution without being given the chance to see whether they are willing to play the game and act the part of good citizens In a country where the leprosy problem is limited and where there is the possibility of bringing every open case under segregation compulsory segregation may be justified but as in mental illness those

who need isolation as a protective measure should be given (*a*) the chance of seeking voluntary admission or (*b*) where facilities are available of isolating themselves in their own homes Only when a patient cannot or will not listen to persuasion should the force of the law be invoked In other words all measures with regard to compulsory segregation should be as the British policeman s baton hidden only to be used in case of an emergency

Another principle which should be enunciated is that no closed case of leprosy needs isolating from healthy members of the community If the patient is crippled or has ulcers which need care then he should be admitted into a home and cared for but not treated as a criminal and forcibly isolated It is doubtful whether blanket regulations are ever justified in dealing with leprosy for another axiom which needs to be reiterated is that measures taken for the isolation of infective cases must keep pace with available accommodation In order to illustrate the development of the legal aspect of leprosy the Madras Public Health Act (1939) is an excellent example When this Act was first promulgated no person with leprosy no matter whether it was infective or non infective was allowed to appear in a public place to travel by train bus horse or man drawn vehicle or to do anything which involved his coming into contact slight or intimate with anyone outside his own house There were however no provisions made to prevent the patient from staying at home and infecting all his children In consequence the Act as far as leprosy was concerned was observed in its breach rather than in its compliance It was therefore found necessary to amend it drastically As an appendix to this chapter the present provisions for leprosy in the Public Health Act are given It will be noted that in the first place leprosy is defined as that type which is open and from which bacilli can be discovered from the skin or mucous membrane of the nose by standard methods of examination Secondly the force of law is only resorted to after an area is declared a segregation area and sufficient facilities are available for the isolation of all infective cases This means that legal powers must keep pace with facilities for segregation and that only areas where leprosy is an important endemic disease need be declared areas under segregation The position with regard to this is briefly that if a group of villages are found to be infected and facilities are organised for the isolation of open cases then these villages can be declared segregation areas under the Act If a patient does not submit himself to the regulations concerning the segregation of open cases he can be made to do so under the power of the law The declaration of certain areas as special areas does not appear to be of much value apart from facilities for segregation Generally speaking widespread measures to prevent patients with leprosy whether open or closed travelling in public conveyances using town or village water supplies buying food in the bazaar etc defeat their own end for they are impossible of enforcement In other words only as facilities for segregation are available and special measures to deal with infective cases devised are any regulations prohibiting employment travelling etc likely to be successful

Too often leprosy regulations penalise the poor and the outcast and leave the rich and influential unaffected Further only when a realistic view is taken of leprosy and the whole campaign is related to the principle of controlling leprosy in areas where it is spreading can there ever be any likelihood of the development of a system which will receive the support of the public and be calculated to arouse the interest of the profession and achieve the required result namely the elimination of leprosy from the country in question

## CHAPTER XXII

# PRACTICAL METHODS OF LEPROSY CONTROL (as illustrated by the proposed organisation of the Leprosy Campaign in the Madras Presidency)

The Madras Presidency of South India represents an area where it is possible to embark on a leprosy prevention programme on a wide scale. The outline of the work already done and a description of the possible developments will illustrate the methods along lines which we believe will most effectively bring the disease under control.

In January 1945 the preliminary building up of the leprosy organisation received official approval by the creation of a special appointment by the Government of Madras of a Director of the Leprosy Campaign; the duties of this official were combined with those of Director of Leprosy Research and the main task of this officer was to correlate all the official leprosy work in the Presidency and gradually build up an organisation which would cover:

(1) Rural leprosy
(2) Urban leprosy
(3) Child leprosy
(4) Research
(5) Teaching
(6) The relationship of existing and new institutions to the general leprosy campaign
(7) The place of the general hospital and out-patient clinic in the campaign
(8) Propaganda



Fig. 153.—General View Rural Leprosy Preventive Unit

### (1) Rural Leprosy

Muir many years ago emphasised the fact that leprosy was largely a rural disease and that while there was a considerable amount of leprosy in the larger towns in districts in which the disease is prevalent, yet there was a constant migration for various reasons—economic, social, industrial—from the villages into towns. Occasionally there is a reverse movement as reported by Chandy in the Fyzabad district of the United Provinces where persons who had migrated to Burma have returned to their village

with leprosy and set up foci of the disease It is our firm belief that leprosy can only be controlled in rural districts by the establishment of rural preventive units and to this end the first rural preventive unit was begun in the Madras Presidency in 1930 The object of these units is to deal with leprosy in those rural areas where the disease is serious It is manifestly impossible owing to the enormous expense involved to provide complete segregation for all infective cases neither do we think that this is necessary for we believe our task is to discover the minimum amount of segregation which will control the disease In the Middle Ages in Britain as already pointed out it was evident that complete segregation was not attempted The regulations which were enforced through the authority of the Church resulted in certain precautions being taken in the day time and absolute isolation at night from all healthy persons



FIG 154 —Segregation huts

particularly children It is well known that in India at least the majority of villagers are agriculturists and therefore are in the fields the greater part of the day It was thought therefore worth while commencing an experiment in leprosy control in a group of villages in the vicinity of Chingleput At first nine villages were chosen but this was found to be too large for practical purposes hence the experiment was cut down to four villages with an approximate total population of 3 400 and an incidence of leprosy varying between 78 per thousand and 29 per thousand

Two plots of land were selected within two miles of the villages surveyed and on one administrative treatment and staff blocks have been built These consist of

(a) Doctor s house
(b) Store house and water tower
(c) Well and pump
(d) Compounder s house
(e) Nursing orderly s house
(f) Gardener peon s house
(g) Laboratory
(h) Treatment centre
(i) Guest house



Fig 1 —Staff are — howi g water tow and om of taff hou Not they re b lt in simple ill ge tyle w th thatcl ed roofs

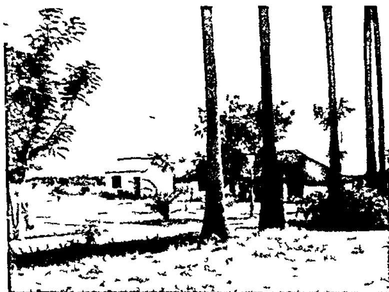


Fig 156 —Lab t ry an l tre tm nt hall

On the other side of the road the segregation area is built which consists of seven houses and a well The whole capital outlay including equipment was Rs 8 382/6/ (approximately £650) and the annual recurrent cost is Rs 2 235/ (approximately £175)

An intensive survey has been completed and for the past five years all open cases from the four selected villages have been required to sleep in the segregation area at night thus ensuring the prevention of night contact with children Because of the difficulty of dealing with women and children who are open cases these are persuaded to seek admission into the Lady Willingdon Leprosy Sanatorium (twenty three miles away) To all who come to sleep at night a ration of rice is allowed sufficient for an evening meal One of the philanthropic minded gentlemen in a near by village has been contributing rice for this purpose and must have saved the scheme over the past five years thousands of rupees

The experiment in night segregation has continued for five years and the following table gives the comparison and summary of follow up surveys in these villages over this period

SUMMARY OF SURVEY FOR THE YEARS 1939 1942 AND 1945 OF THE RURAL INVESTIGATION CENTRE MADURANTAKAM

| Village | 1939 | | | 1942 | | | 1945 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Gross Inci dence | Open case Rate | Child Rate | Gross Inci dence | Open case Pate | Child Rate | Cross Inci dence | Open case Rate | Child Pate |
| *Polambakkam village | 42 52 | 25 80 | 32 60 | 52 89 | 23 25 | 25 58 | 44 13 | 21 87 | 9 37 |
| *Polambakkam cheri | 45 55 | 23 80 | 19 05 | 44 00 | 13 63 | 13 63 | 38 79 | 16 68 | 16 66 |
| *Perambakkam village | 38 46 | 28 57 | 14 28 | 38 64 | 31 25 | 18 75 | 28 39 | 18 18 | 9 09 |
| *Perambakkam cheri | 78 12 | 30 00 | 50 00 | 60 60 | 37 50 | 50 00 | 82 19 | 33 33 | 25 00 |
| Maluvankaranai village | 33 12 | 45 45 | 18 18 | 48 41 | 29 41 | 23 53 | 70 65 | 19 23 | 23 08 |
| Maluvankaranai cheri | 29 12 | 50 00 | 50 00 | 56 33 | 30 77 | 38 46 | 49 79 | 25 00 | 25 00 |

Villages in which control measures have been in force

The village and cheri of Maluvankaranai has been added as a comparison for no control methods have as yet been established It is interesting to note that there has been a striking drop in the incidence of leprosy in two villages namely Polam bakkam cheri and Perambakkam village It is of further interest to note that in the village and cheri of Maluvankaranai that the incidence of leprosy has increased more than twice in the former and one and a half times in the latter What to us is more signi ficant however is the marked decrease in the open case rate in three out of the four villages and the consistent and definite fall in the child rate between the years 1939 and 1945 While no definite conclusions can be drawn we feel that the overall picture

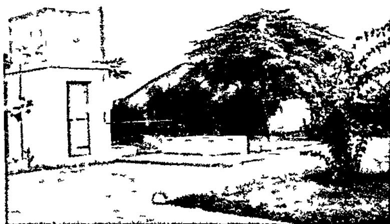


Fig 1 7—Water towe  and compoun le  s (1  penser) house



Fig 158—Gue t house

shows a downward trend indicating a possible favourable turn in the epidemicity of leprosy in these villages If this observation proves to be confirmed then the whole rural leprosy programme will have been simplified We visualise the day when the main rural leprosy prevention units will be linked to sub units with facilities for segregation but visited by a doctor from the main unit each week and this in turn will be connected with the nearest general hospital which ordinarily would be the headquarters of the district so that emergency medical care will at all times be available in the leprosy or general wards of the hospital It should not be difficult to garage an ambulance at the rural centre in order to provide transport for such cases

**(2) Urban Leprosy**

Owing to the overcrowded nature of most of the towns of the East the difficulty of securing a site for local segregation and the impossibility of enforcing this because a co operative spirit is hard to foster under urban conditions the control of urban leprosy therefore presents many problems The question of segregation for limited areas in a town has also to be ruled out because there is seldom sufficient land to organise this in the same way as in rural leprosy In building up a scheme for urban leprosy control the first step which should be taken is to gather information of the relative prevalence of leprosy There are two methods by which this can be done namely examination of school children for signs of leprosy and/or scrutinising the admission list of out patient clinics In one or other of these ways the areas from where cases of leprosy are discovered can be flagged on a map and those of relative high incidence can thus be seen at a glance More intensive methods can then be applied either by following up all children who have leprosy to their homes and in this way tracing all the immediate contacts or by undertaking an intensive survey in the areas of relative high incidence as indicated by these preliminary investigations of admissions to out patient clinics Both methods are time consuming and therefore if urban leprosy is to be thoroughly investigated an officer in charge of urban control should be appointed who would work under the supervision of the director of leprosy control Attached to the urban control office should be a survey party whose function would be continually to investigate alleged areas of high incidence in the town Such a system could only be set up in towns of over 100 000 inhabitants In district headquarters towns the district leprosy officer with the survey unit would include the smaller urban areas in his whole organisation

The difficulty of urban control will be fully appreciated by anyone who has attempted completely to survey areas in towns for the better to do families are usually the most obstructive Where possible therefore the preliminary school survey is better done in co operation with adequately trained school medical officers at a time when the general examination for other diseases is being conducted In the city of Madras the organisation has been set in motion and a leprosy officer who is a man of experience has been placed in charge of urban investigation In so far as it is almost impossible to set an area aside in towns for segregation there are only two alternative courses possible (1) institutional segregation (2) home isolation The former method is preferable and should be resorted to whenever possible but in so far as the accommodation in the majority of the institutions in the Madras Presidency is at the present time taxed to the uttermost this is seldom possible therefore home isolation should be attempted The supervision of the carrying out of this should be the responsibility



Fig 159—An open case living in close contact with other members of the family in one of the villages He attended regularly for treatment and night segregation and became negative at the end of two years



Fig 160—A common type of village well

of the health department If every open case would take the undermentioned precautions leprosy would in the course of time come under control

(a) Sleep in a separate room taking special care to keep away from children
(b) Eating sleeping cooking and toilet necessities should be kept separate
(c) Personal clothing bedclothes towels etc should be soaked in anti eptic solution before washing or washed apart from the family s clothes
(d) The patient should have his own chair or mat and should not allow him self under any circumstances to come into contact with children

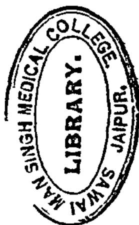





FIG 161 —Same well renovated and made a protected water supply *Village munsiff (headman) standing by well* The help and co operation of officials should always be secured

It is recognised that many of these precautions are in the nature of counsels of perfection and could not be completely carried out but on the other hand if every doctor when called in to treat an open case of leprosy insisted on his absolute separation from children precautions could be taken in a great many houses which would reduce the chances of infection to a minimum Private *practitioners tend to be altogether* too lax about this matter

While all available evidence goes to show that the chief method of infection is close contact in the hou e yet it is not advisable that open cases should be

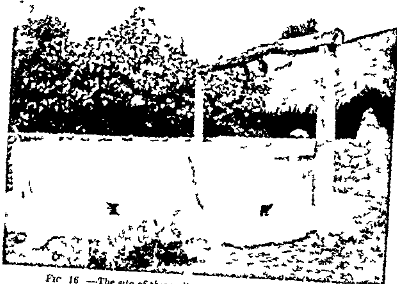
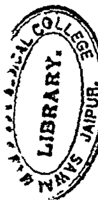


Fig 16 —The site of this w ll was previou ly a manure l eap



Fig 163 —A l rge broken down village well



permitted to continue in employment and should be excluded from the following occupations

(1) School teacher student ayah child nurse or personal servant
(2) Dhobi barber tailor (laundry or pinman)
(3) Food vendor mill distributor or public servant
(4) Driver of any public conveyance either motor propelled horse drawn or man drawn
(5) Any employment involving contact with children



FIG 164—The same well built up for irrigation purposes (see Fig 163)

The amended Public Health Act makes provision for the prohibition of the above employment

With regard to institutional segregation in the post war reconstruction scheme for leprosy in the Madras Presidency provision has been made for the building of institutions for the larger towns and it is hoped that as authorities gradually realise the need for these and the impossibility of controlling urban leprosy without such arrangements that they will implement this proposal as early as possible The first institution organised for this purpose should be in connection with Madras city itself Institutions then should follow in Madura Tuticorin and in all the bigger towns of the Presidency This manifestly will involve a great expenditure of money but if



Fig 16. —A c op of veg tables re ulting from th re io ate l v llage w ll



Fig 16b —Filthy village rubb h pit area.

authorities are in earnest in this matter of urban control the sooner it is realised that comprehensive measures alone will meet the problem the quicker will leprosy in the larger towns come under control and the more rapidly will be dispelled the prevailing notion that leprosy can be controlled by such superficial methods as out patient centres without arrangements for segregation Too often have we lived in a fool s paradise as far as leprosy is concerned and it behoves city health officers to take leprosy as seriously as they would take malaria plague cholera or any other of the major endemic diseases for then and then alone will there be any hope of controlling urban leprosy Further in towns as in villages leprosy is not mainly confined to the poor but can be found in all walks of life from the meanest hovel to the statelıest mansion

### (3) Child Leprosy

It will be realised by the reader that very great emphasis has been laid on leprosy in children and that we maintain the thesis that if leprosy is brought under control as far as children are concerned then the number of adults who become infected are so few that the epidemic is unlikely to be maintained by adult infection alone In the Madras Presidency the following children s work has been organised

(i) Silver Jubilee Clinic for the study of child leprosy
(ii) Children s Leprosy Sanatorium Ettapur Salem District
(iii) Children s section in connection with the Lady Willingdon Leprosy Sanatorium
(iv) Proposed new home for women and children under the Kasturba Gandhi Memorial Fund

(i) *Silver Jubilee Clinic for the Study of Child Leprosy*

Saidapet is a suburb of Madras some five miles from the centre of the town in which there has been active health work undertaken for many years in connection with maternity and child welfare Owing to the reported high incidence of child leprosy an investigation unit was established in 1936 largely thanks to a donation from the King George V Silver Jubilee Fund and to a handsome gift from that well known highly esteemed philanthropist the late Sir Frank Carter The clinic is chiefly a research unit whose main objects are

(1) To investigate the causes of the development of leprosy in children
(2) To investigate the types of leprosy in children and to study the significance of the various types in relation to their clinical importance and the factors which influence the development of lepromatous leprosy in later life

While treatment is given this clinic is primarily an investigation centre and much of the epidemiological data already submitted has been based on the work of this clinic Over 700 children with leprosy have been enrolled close on 400 of which come from the immediate vicinity of Saidapet The children are divided for investigation purposes as follows

(a) Those who should be examined every six months
(b) Those who should be examined every three months
(c) Those who should be examined every month
(d) Closed cases under treatment
(e) Open cases



Fig 167 — A feld bo ght by ill ges throu h persu r r e an la r l all r bb l tran ferred



Fi 168 — Ol l r d b h pit area (compare ith top p t re) fil ed

All children are photographed and as many individual files as possible are maintained which include the following data

(a) Clinical photograph
(b) Chart of lesions at varying intervals
(c) Record of physical examination
(d) Record of economic condition of family
(e) Biopsy of typical lesion and if necessary further biopsies

Thus it is hoped to maintain as complete a history as possible of children and their families and so be the better able to understand the nature spread and course of child leprosy



FIG 103—Silver Jubilee Clinic for the study of child leprosy (S J C C) Saidapet Madras

For two years the clinic was run from gifts from private friends In the year 1938 the clinic was taken over by the Madras Provincial Branch of the British Empire Leprosy Relief Association and it is now hoped that as the leprosy campaign becomes more and more the concern of the Government that this unit will come under the direct control of the Director of the Leprosy Campaign and be part of the overall scheme for leprosy in the Presidency

(ii) *Children s Leprosy Sanatorium Ettapur Salem District*

Owing to the importance of child leprosy the impossibility of isolating children with infective leprosy under any condition in a village or town and the need for continuing their school studies the only practical method is to organise institutions for children with leprosy To this end through the endeavours of an enthusiastic lay worker a substantial sum of money was raised to build and equip a leprosy sanatorium for children



Fig 1 0—S J C C Cent 1 t tm nt hall show ng a 1 room



Fig 171—S J C C Doct room

in the Salem District of the Madras Presidency While this sanatorium has only been functioning a few years and has been seriously handicapped owing to the war it has shown that by this means it should be possible to meet the problem of infective leprosy in children and through such work train the child to be fit for life when he is discharged from the home

(iii) *Children's Section in the Lady Willingdon Leprosy Sanatorium*

In the year 1932 the authorities in the Lady Willingdon Leprosy Sanatorium realising the need for providing institutional care for children made arrangements to enlarge the institution in order to admit more children The children's section is

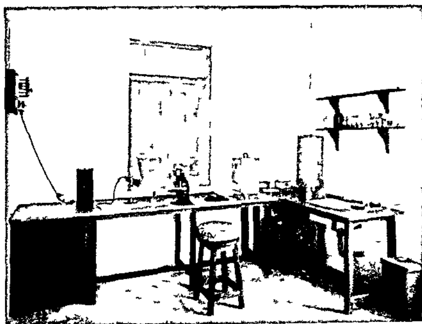


Fig 17 —S J C C Laboratory

entirely separate and facilities are provided for the continuation of their schooling In addition there are both Scout and Girl Guide companies and opportunities for game While at school the boys can learn weaving carpentry or be trained in other ways to be fit for life when they are discharged No large leprosy institution is complete without providing for the care of children with leprosy especially that type which is infective or potentially infective In so far however as only a small proportion of cases pass into lepromatous leprosy in adult life or become deformed admission to a children's leprosy institution should be strictly selected

(iv) *Kasturba Gandhi Memorial Home for Women and Children*

A few years ago the wife of Mahatma Gandhi passed away and a fund was raised for her memorial This was subscribed to all over India and the money collected was placed under a trust deed to be used for work among women and children in country districts Part of the income of the fund has been set aside for leprosy work among

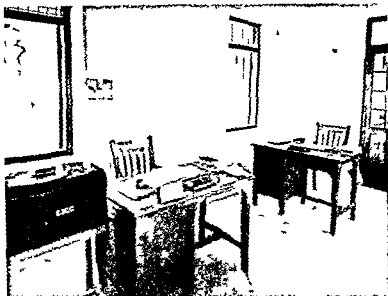
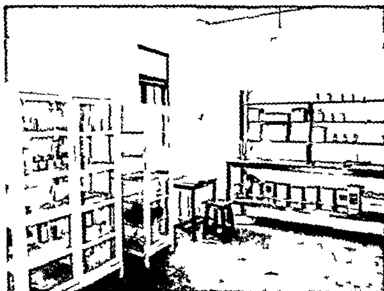



Fig 13—SJCC Cl k r on



Fi 14—SJCC (D pens )

women and children in rural areas An area in the South Arcot district Madras Presidency will be chosen in which the incidence is high and a rural home in that area will be established The object of the home will be

(1) To house give treatment and train in some useful employment all women and children (female) who have infective leprosy or potentially infective leprosy
(2) To admit boys up to the age of seven after which they will be transferred to a larger sanatorium with facilities for caring for older boys

In connection with this home but not dependent on the Kasturba Fund will be developed a rural preventive unit It would be impossible to control leprosy only by concentrating on women and children and therefore a work such as this would not attain its objective—that of bringing leprosy in women and children under control —unless it were associated with segregation facilities for male cases The leprosy prevention unit while closely co operating with the women and children s home will be part of the general scheme for the control of leprosy in the South Arcot district and will when established be linked with the district leprosy control office at the head quarters town in Cuddalur where the district leprosy control officer when appointed would establish his quarters Thus through the opportunity afforded by this fund, it will be easier to set in motion a preventive leprosy scheme for the district of South Arcot with its sanatorium children s home rural and possible urban units as already described and envisaged

**(4) Research**

No adequately organised campaign can hope to develop and succeed in its objective without facilities for re earch Considering the nature of the disease its widespread ravages throughout the world and its antiquity it is deplorable that the opportunities offered to medical men and the facilities for research are so meagre In the whole of India there is only one recognised centre of research and that is the School of Tropical Medicine in Calcutta Research work is being undertaken elsewhere particularly in Madras but it is carried out as a part time occupation under very great strain and difficulty it is only within the last year that a beginning has been made to consider the question of a full time Government research officer If the same number of well trained personnel had been available for leprosy research in India as for malarial research much more progress would have been made It is hoped that this contribution while not detailing a research programme will at least convince readers that it is time that research scholarships were made available for leprosy and that a team or teams of research workers with a well trained pathologist biochemist and a clinician must be enlisted if further progress is to be made in the understanding of this most baffling of all diseases

Apart from re earch into the pathological immunological and therapeutic aspects of the disease there is wide scope for clinical research along the lines of neurology and orthopaedics and the opportunities for epidemiological research through field units is unlimited Leprosy research should preferably be undertaken in connection with a medical college and linked up with institutions where the most up to date equipment and staff are available With all the goodwill in the world it is impossible to develop effective investigation work apart from proper facilities While many useful and

valuable observations can be made by the enthusiastic worker no substantial progress will be achieved unless leprosy research is put on a sound basis to develop along with the major researches of other diseases and health problems of the country The Director of Leprosy Research should be a full time worker but of sufficient research experience and leprosy training to organise a comprehensive research programme covering laboratory field clinical immunological and animal investigations and thus only will leprosy research find its rightful place and attract research workers of real eminence Leprosy research workers should be remunerated on the same scale as any other research officer The Indian Research Fund Association has subsidised leprosy research in India for the past twenty five years

**(5) Teaching**

The general programme of teaching has already been discussed At the present time in the Madras Presidency facilities for teaching are organised in the medical college hospitals but the lack of trained personnel is a serious handicap to effective teaching It is hoped that as soon as trained men are available with higher qualifications then there will be lecturers organising their own leprosy departments in every teaching hospital in the Presidency It would be a tragedy of the greatest magnitude in the organisation of the new medical colleges in India if leprosy were given the same casual attention it has up to now received Not until the medical student himself is taught by enthusiastic and experienced teachers will there be any hope of finding recruits from the newly qualified graduates who are willing to specialise in leprosy and yet the leprologist is as essential to the community in countries such as India as is the malariologist

**(6) The Relationship of Existing and New Institutions to the General Leprosy Campaign**

The various types of institutions necessary for the efficient organisation of the leprosy campaign have already been indicated The general policy with regard to these should be in conformity with the overall plan of leprosy control It is therefore a prime necessity that the institutional policy should be such that it will make the greatest possible contribution towards the control of leprosy If this is to be so strict selection of the type of cases to be admitted into institutions should be made and it is recommended that the following categories should receive preferential admission

(1) Early lepromatous cases (infective) who are liable to pass on to the more advanced stages unless given institutional treatment
(2) Infectious cases whether early or late in whose house there are young children liable to be infected
(3) Acute conditions needing hospitalisation should be admitted temporarily if there is a bed available in the hospital
(4) Certain cases which need special investigation and study
(5) All active cases among children whether open or closed needing institutional treatment

All persons who have advanced leprosy should be looked after in homes for the crippled and advanced cases these can be attached to an existing institution but in many ways it is preferable to organise special homes for such cases and those that become

advanced and crippled should be transferred from sanatoria to these homes. In this connection, while it is understandable that official bodies should pay capitation grants to voluntary institutions for the care of infective cases, the withholding of grants because a person is no longer infective is not justified. The State must assume responsibility for the care of the deformed and crippled, and if a person is unable to earn a livelihood *through the crippling nature of his disease, although it is no longer infective* he should be supported by the State. The Madras Government extends its capitation grant to all those considered by the medical authority of the institution to have ulcerations which are dangerous to life or limb and are unable to be cared for under local conditions.

### (7) The Place of the General Hospital and Out-patient Clinic

*Although it has been stated that* out-patient centres treating a few dozen or several hundreds of cases and unconnected with definite preventive projects can contribute little or nothing towards the control of leprosy, yet the principle remains that for persons suffering from chronic diseases such as tuberculosis, leprosy or syphilis, treatment should be available. Therefore facilities for the treatment of leprosy should be organised at every headquarters hospital, District Board or Local Fund Dispensary. If thought advisable, a special shed might be set apart for this purpose; in other words the routine treatment of leprosy, like the treatment of any other chronic disease, should not be dealt with only by a special department, although such departments are necessary. Routine work can be done at the ordinary hospital or dispensary, thus leaving investigation and experiment to the specialist. Not until doctors in ordinary *Government hospitals and dispensaries are willing to admit those suffering from leprosy* on this basis will any substantial progress be made. Similarly, at every hospital situated in districts where leprosy is prevalent, facilities should be available for the treatment of persons needing immediate medical or surgical attention, even though they may suffer from leprosy. Tuberculosis, typhoid and syphilis are continually being treated in the wards of the ordinary hospital, and therefore there is no justification, apart from traditional prejudice, for placing leprosy on a different footing, especially if the medical profession could only forget their prejudice and remember that leprosy is probably less dangerous than these other diseases. It is time leprosy was treated as an ordinary disease and not placed in a special category by itself. If authorities were prepared to admit persons with leprosy who were also suffering from acute infections into the infectious diseases wards of the local hospital, then rural centres could be much more extensively organised, for they would then not be solely dependent on special leprosy institutions when those in the segregation unit needed immediate medical or surgical relief.

### (8) Propaganda

It will be realised that if the recent advances in methods of diagnosis and prevention of leprosy are to be made available, the question of propaganda is of prime importance. Too often modern teaching, including leprosy propaganda, is based on the traditional conception of the disease, and the reader is never altogether freed from the ancient Biblical ideas that those suffering from leprosy are unclean. "Unclean, unclean without the camp *shall be his habitation*." Again I do not wish to be misunderstood, but I

would remind the reader that the lay conceptions of leprosy are not due to any error contained in the Scriptures but to the fact as previously pointed out that in Old Testament times the word Zaraath in Hebrew used as a generic name for a group of diseases was translated leprosy and persons were declared ceremoniously unclean when they had any malformation or any disease which was likely to be dangerous or produce a permanent blemish It must be remembered that there is the grim and terrifying picture of advanced leprosy which should form the sombre background of propaganda and yet let us not forget that horror and dread are not the prerogative of leprosy alone One only needs to consider such diseases as cancer filariasis yaws advanced sleeping sickness infantile paralysis and many other deforming diseases to appreciate this statement yet the appalling end result of some of these diseases is not overemphasised to the same extent as that of leprosy Philanthropic societies may think that without this grim picture ever held before the public the appeal will lose its effect that surely is an unworthy motive for propaganda The challenge is the challenge of a crusader who enters the battle so that the war may be won he does not except under special circumstances dwell on the horror of the war but on the glory of it He does not emphasise the casualties in dead wounded and blind but on the victories won and on the routing of the enemy Let us raise the whole subject of propaganda in leprosy to the level of a worthy crusade a work not only for those who are called to care for the wounded and dying but a call to the knight errant who has the opportunity of finding in leprosy great victories for medical research and then placed in its right perspective leprosy will appear a worthy disease with which to battle and not be associated in the minds of men with a special form of sin incurable unalterable and altogether hopeless The appeal to help the casualties in the battle must ever be there but it is the battle and not the wounded the glory and not the death which appeals thus all propaganda must be informative instructive comprehensive and attractive to all In all booklets lantern lectures and talks the child must come first There must be presented a reasoned account of the disease emphasising its comparative benignity and its tendency to spontaneous cure An understanding knowledge of the disease must be imparted so that persons do not go about in a cold sweat of fear at the very mention of the name of leprosy but yet are willing to take reasonable precautions against infection The whole technique of propaganda needs completely overhauling and at the present time a completely fresh approach to the subject of leprosy from the propaganda point of view is being presented by the Madras Branch of the British Empire Leprosy Relief Association and it is hoped that these publications through the Honorary Publicity Secretary will revolutionise the whole subject and help to convince the public that it is no more shameful to acquire leprosy than to acquire measles Propaganda must keep a right perspective with regard to treatment for too often is this emphasised to the exclusion of prevention and fosters the idea all too readily accepted that all that is needed in leprosy is a doctor with a bottle of hydnocarpus oil and sufficient dexterity to inject the remedy without pain !

A fundamental principle of all propaganda must be concentration on certain main points for the public will only be confused by too much detail In addition while a certain amount of press license is permissible propaganda based on exaggerated claims is bound to fail as the public will ultimately become discouraged and disappointed when they realise that it is impossible to bring leprosy under control by establishin

treatment centres only In all propaganda the following points should be emphasised first

(1) Leprosy is an ordinary disease communicated by close contact by a person in the infective stage It is neither venereal in origin nor is it a particular manifestation of divine displeasure
(2) All leprosy is not equally serious Therefore all persons who suspect themselves to be suffering from leprosy should seek specialist advice to ascertain just what measures and precautions should be taken
(3) Children are particularly susceptible to the disease whereas adults are largely non susceptible If every mother in India could be made to realise that it was as dangerous to allow a child to come into contact with a person suffering from infective leprosy as to permit him to play with a poisonous snake a great step forward towards the control of leprosy would have been taken
(4) Leprosy except among children is not a highly infective disease so that much of the fear and prejudice it arouses is entirely unwarranted
(5) If a responsible medical practitioner has declared a person non infective then no discriminatory action should be taken against him either by refusing him entrance into a school or prohibiting his employment

The present series of propaganda slides tend to emphasise the results of treatment *to the exclusion of the more important aspect of prevention* *Before and after treatment* slides should not be shown unless carefully explained for an unduly optimistic impression is likely to be created in the minds of the public

A new approach to publicity is being developed but the proper technique will take years to perfect It is certain that without the preparation of the right type of material to be used in the schools colleges for public lectures and private distribution the most scientifically planned campaign will completely fail for without adequate support from the ordinary citizen and a well informed public co operation is impossible and the conquest of leprosy will remain an unattainable ideal

### (9) The Place of Voluntary Work in the Leprosy Campaign

It must ever be remembered that if it had not been for voluntary endeavour the progress made in the last twenty years would have been impossible The writer owes his interest in leprosy in the first instance to the Mission to Lepers for this and other philanthropic organisations mainly inspired by the example of Christ were the pioneers in leprosy work The names of Father Damien Mary Reed and many unknown but nevertheless faithful leprosy workers should be honoured along with the great souls of this world for it was through their sacrifice that modern leprosy work was made possible It therefore behoves all official bodies to take full cognisance of voluntary work and encourage missionary societies and other organisations to undertake leprosy work The voluntary worker needs encouragement and leadership but until recently this has not been forthcoming and he seldom has the time or the necessary training to undertake the direction of a widespread campaign If however this is well organised by a full time official in complete sympathy with the work of philanthropic societies then it will be found that the institutions and homes of the Mission to Lepers and other societies will play a part of incalculable value in the leprosy campaign for without the full co operation of the authorities of these institutions the overall plan would be greatly handicapped

**Practical Application**

We are now in a position to outline the plan of campaign which will eventually we hope be devised for the Madras Presidency In doing this we trust that it will be helpful to preventive workers in other countries The direction of the campaign will be in the hands of the Director of Leprosy Campaign and he would be solely responsible to the Medical Administrative Head of the Presidency At the headquarters of the campaign a survey unit will be available which on receipt of information or on the initiative of the Director will be available to investigate alleged high incidences of leprosy anywhere in the Province In each district where leprosy is prevalent there will be a district leprosy control officer whose task will be to develop a leprosy unit attached to the Government headquarters hospital This unit will consist of

(1) Wards with operation theatre attached to deal with emergency cases sent from outside i e from rural prevention units or outlying clinics
(2) A treatment centre
(3) A laboratory
(4) A district campaign office

Attached to the headquarters unit will also be a survey party The duty of the officer in charge would be to investigate leprosy in the surrounding district and recommend the organisation of suitable preventive units in areas where leprosy is a serious endemic disease

The rural preventive units with their sub centres would keep in direct touch with the District Leprosy Control Office

In each district where leprosy is prevalent would be organised a sanatorium with if necessary its auxiliary units of Children s Sanatorium and Cripples Home This sanatorium would ordinarily admit cases from areas where there are no control units or from towns which are not big enough to have their own leprosy hospital

Throughout the larger towns e g Madras Madura etc special leprosy sanatoria would be organised to deal with infective cases who will not or cannot isolate themselves In this way areas of high incidence in the villages will have their own system of prevention through the rural unit and infective cases from the smaller towns and areas of less importance will be persuaded to go to the nearest leprosy sanatorium

Along with this teaching in medical college hospitals with efficiently equipped departments will be organised A research centre in connection with a central leprosy sanatorium and preferably linked to a medical college is contemplated and a children s unit for the segregation and study of child leprosy will be established

The propaganda side will be directed by the Director of Leprosy Campaign but will largely be undertaken by the British Empire Leprosy Relief Association (Madras Branch) It is hoped that a central propaganda office will be established so that all information concerning the warfare against leprosy can be tabulated the programme of the campaign flagged on a map and facilities for the training of the welfare officers to be attached to the various special units and leprosy hospital be explained to all prospective candidates Thus every aspect of leprosy will be cared for and the enemy attacked in every quarter Such a programme will cost much in money time and energy but as demonstrated by the work of the Silver Jubilee Children s Clinic at Saidapet and the Rural Unit in Chingleput District the leprosy campaign is a most potent lever by which to raise the health level of the entire community and therefore brings dividends in health happiness and cleanliness far beyond its own limited sphere

To day, when so much of value has been destroyed in the cataclysm of war there rises a new hope a fresh challenge For the call goes forth to all worthy men to attack and break down the seemingly impregnable fortress of disease by a new path through the avenues opened up by modern leprosy research Thus those who are working in a branch of medicine which was but a short time ago neglected and almost despised see new vistas of opportunity and find themselves placed in the very vanguard of the forces pledged to build a new order where the evil triad of disease malnourishment and economic servitude will be for ever banished

## APPENDIX I

# ABSTRACT OF LEPROSY SECTION OF THE MADRAS PUBLIC HEALTH ACT (AMENDED 1944)

## ACT No IV OF 1944

## PART IV LEPROSY

### Definitions

In this part—

(a) Leprosy means open leprosy that is to say that form of the disease in which leprosy bacilli can be demonstrated from the mucous membrane of the patient s nose or from his skin by any recognised standard method of examination approved by the Surgeon General with the Government

(b) Authorised practitioner means a medical practitioner registered under the Madras Medical Registration Act 1914 and authorised by the Government in this behalf

### General

A local authority may and if so required by the Government shall make such arrangements in its local area as may be directed by the Government for

(a) the free diagnosis and treatment of persons suffering or suspected to suffer from leprosy and
(b) the prevention of infection from leprosy

(1) No person who knows that he is suffering from leprosy shall until he is certified by an authorised practitioner to be non infectious and to have been so for a period of not less than three months engage himself or accept any employment

(i) as a cook attendant workman salesman server or carrier in any place where food is sold to members of the public or is prepared or stored for such sale
(ii) as a dairy worker tending on or milking cows whose milk is to be sold or distributed to members of the public or as a seller or distributor of milk to members of the public
(iii) as a driver or conductor of a public conveyance
(iv) as a public servant or
(v) in any other capacity which in the opinion of the Health Officer involves deleterious contact with other persons not suffering from leprosy

(2) No person who knows that he is suffering from leprosy shall until he is certified by an authorised practitioner to be non infectious and to have been so for a period of not less than six months

(a) attend any school college playground or other similar place either as a teacher or as a member of the staff employed therein or

To day, when so much of value has been destroyed in the cataclysm of war there rises a new hope a fresh challenge For the call goes forth to all worthy men to attack and break down the seemingly impregnable fortress of disease by a new path through the avenues opened up by modern leprosy research Thus those who are working in a branch of medicine which was but a short time ago neglected and almost despised see new vistas of opportunity and find themselves placed in the very vanguard of the forces pledged to build a new order where the evil triad of disease malnourishment and economic servitude will be for ever banished

(b) engage himself or accept any employment

(i) as a doctor nurse midwife ayah or orderly
(ii) as a barber or hairdresser
(iii) as a tailor
(iv) as a dhobi or launderer,
(v) as a house servant personal attender or a peon or
(vi) in any other capacity which in the opinion of the Health Officer involves deleterious contact with children

(3) No person who has the care of any person whom he knows to be suffering from leprosy shall cause or permit such person to engage himself or accept any employment in any of the capacities referred to in sub section (1) or to attend any place or engage himself or accept any employment in any of the capacities referred to in sub section (2) until he is certified by an authorised practitioner as set forth in sub section (1) or sub section (2) as the case may be

(4) No one shall engage or employ any person whom he knows to be suffering from leprosy in any of the capacities referred to in sub sections (1) and (2) until he is certified by an authorised practitioner as set forth in sub section (1) or sub section (2) as the case may be

SPECIAL AREAS

The Government may by notification declare any area in the Province to be a special area for leprosy and thereupon the following provisions shall apply to such area

(1) No person who knows that he is suffering from leprosy shall

(a) enter any public conveyance used for the conveyance of passengers at separate fares or
(b) enter any other public conveyance without previously intimating to the owner driver or conductor thereof that he is suffering from leprosy

(2) No person who has the care of a person whom he knows to be suffering from leprosy shall permit him to be carried

(a) in any public conveyance used for the conveyance of passengers at separate fares or
(b) in any other public conveyance without previously intimating to the owner driver or conductor thereof that he is suffering from leprosy

(3) The owner driver or conductor of a public conveyance used for the conveyance of passengers at separate fares shall not convey therein a person whom he knows to be suffering from leprosy at any time when a passenger not suffering from leprosy is being conveyed therein

Provided that a person suffering from leprosy may be conveyed in the public conveyance aforesaid in such cases of emergency and subject to such restrictions and safeguards as may be notified by the Government

(4) The owner or a driver of any public conveyance may refuse to convey any person suffering from leprosy until he has been paid a sum sufficient to cover any loss and expense which will be incurred by reason of the provisions of the next succeeding sub section

(5) The person in charge of a public conveyance in which a person whom he knows to be suffering from leprosy has been conveyed shall as soon as practicable give notice to the Health Officer of the local area in which the conveyance is usually kept and before permitting any other person to enter the conveyance shall cause it to be disinfected

(6) The local authority when so requested by the person in charge of a public conveyance in which a person suffering from leprosy has been conveyed shall provide for its disinfection

(1) No person who knows that he is suffering from leprosy shall

(a) attend any school college playground or such other place or
(b) take any book or cause any book to be taken for his use or use any book taken from any public library or circulating library

(2) No person who has the care of a person whom he knows to be suffering from leprosy shall permit him to do any of the acts prohibited by sub section (1)

SEGREGATION

The Government may on the recommendation of the Director of Public Health by notification declare any area in the Province to be a segregation area if they are satisfied that in such area adequate segregation accommodation for persons suffering from leprosy has been provided by the local authority or has been placed at its disposal and set apart by it for the purpose and thereupon the following provisions shall apply to such area

(i) The Health Officer may by notice require any person suffering from leprosy and residing within the segregation area to remove himself to such segregation accommodation as may be specified in the notice and remain there until such time as he is certified by an authorised practitioner to be no longer infectious
(ii) The notice shall allow a reasonable period for compliance therewith
(iii) If the person suffering from leprosy does not comply with the notice within the period allowed therein the Health Officer may have him compulsorily removed to the segregation accommodation specified therein using such force as may be reasonably necessary for the purpose
(iv) The Health Officer may permit any person detained in the segregation accommodation to engage himself or accept employment in any of the capacities other than those already specified provided that it does not involve the performance of any act specifically prohibited by this Act
(v) The notice referred to in clause (i) may be given to the person who has the care of a person suffering from leprosy and thereupon it shall be the duty of the former to remove the person suffering from leprosy to the segregation accommodation specified in the notice
(vi) If any person suffering from leprosy escapes from or leaves the segregation accommodation provided for him without the written permission of the Health Officer or any other officer authorised by him in this behalf such person may be arrested without a warrant by any police officer or by any one specially empowered by the Government and removed forthwith to such segregation accommodation

(vii) The local authority shall arrange for the food clothing and other necessaries of every person suffering from leprosy who is detained in the segregation accommodation but any such person shall be at liberty to make his own arrangements for his food clothing or other necessities

(viii) If any person is arrested under clause (vi) after having been arrested and dealt with under that clause on at least three previous occasions he shall if the Health Officer so directs in writing be produced before a Presidency Magistrate or a Magistrate of the First Class who shall have power to order his detention in a leprosy annexure attached to a prison until such time as he is certified by an authorised practitioner to be no longer infectious and thereupon all the provisions of the law for the time being in force shall so far as may be and with such modifications if any as may be prescribed apply to such person as if he had been sentenced to simple imprisonment for the period for which such detention was ordered

If the Magistrate does not order such detention or if the order of detention passed by him is subsequently cancelled whether by himself or by any other Presidency Magistrate or Magistrate of the First Class the person arrested or detained as the case may be shall forthwith be removed to the segregation accommodation aforesaid

### Revocation of Certificates

Where any authority prescribed in this behalf has reason to believe that a certificate issued in respect of any person suffering from leprosy has ceased to be correct by reason of his having subsequently become infectious such authority may require such person to obtain a fresh certificate from any authorised practitioner of his choice as to the character of his leprosy that is to say as to whether he is or is not infectious

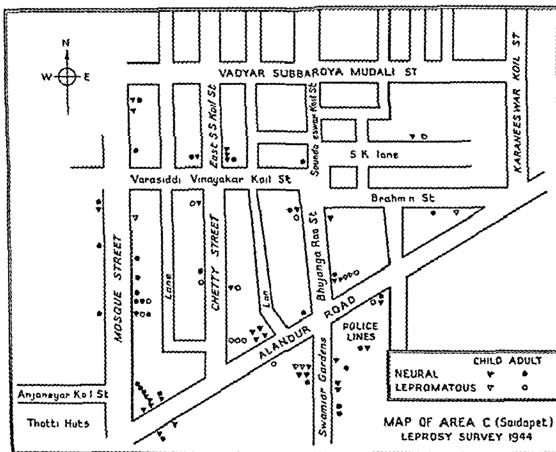
Unless a fresh certificate as aforesaid is obtained by the person suffering from leprosy within such a period as may be prescribed and such certificate declares him non infectious the certificate previously issued shall for the purposes of all the provisions contained in this part be deemed to have been cancelled

## SAMPLE SURVEYS

### I LEPROSY SURVEY OF AREA C SAIDAPET 1944

**Situation**

This is a part of the Saidapet town situated about six miles south of Fort St George on the main trunk road to the south This suburb of Madras is a town of a population




of about 40 000 Though the municipal limits are extensive the town proper is about one and a half miles by one mile and this is the most thickly populated area The population in this part of the Saidapet Municipality is roughly estimated to be about 10 000 This area for purposes of leprosy survey was divided into five smaller areas and called Area A B C D and Lenpet and Edapallayam area This report

is on Area C bounded on the north by Vadyar Subbaroya Mudali Street on the east by a part of Karneeswarar Koil Street on the south by Alandoor Road and on the west by Mosque Street The population is of a mixed type there are a few weaver families some dhobi families and a fairly good number of them are employed in offices in the city and other places

### Main Occupation of the Population

There is no particularly predominant occupation A few weavers dhobies and others employed in offices

### Water supply and Drainage

Since the inception of protected water supply few of the wells in this area are sources of drinking water Well water is used mainly for washing purpo es Drainage in common with other areas is mainly by cesspool collections and removal by carts

### Diet

Staple diet is parboiled rice fish and mutton vegetables varying in quality and quantity according to the economic status of the families

### Condition of Living

Unlike other areas of Saidapet there are a larger number of well to do families in this area Except in Alandoor Road and Mosque Street the number of families living in a house is rarely more than one or two Consequently there is less over crowding in this area

Secondly there is not that degree of free movement of the population amongst themselves as was found in Area A and B This is a favourable feature in this area for it gives less chance for leprosy to spread

### State of Literacy and General Comment

Except in Alandoor Poad and a few families in Mosque Street most of the people appear to be literate Many of them are employed and therefore on the whole in this area it appears that the condition of life is much better than in the other areas of Saidapet

### State of Public Health

Filariasis scabies and skin diseases were frequently met with In Alandoor Road and Mosque Street there appears to be a larger prevalence of hookworm and round worm infections

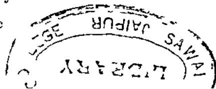
### Leprosy Incidence

There is a tendency in the better class families to keep secret the prevalence of leprosy in their families while in the poorer classes there is little fear of leprosy and therefore freer movement

### History of Leprosy in the Area

As usual with the other areas this being an urban area no history of the disease can be ascertained Contact history can to a certain extent be satisfactorily traced

Silver Jubilee Children s Clinic
Dated 15*th June* 1945



## LIST OF CASES IN AREA C

### Definite Cases

| Serial No | Door No | Name | Sex | Age | Remarks |
|---|---|---|---|---|---|
| | | *Alandoor Road* | | | |
| 1 | 57 | Varadan | Mc | 10 | Tbd patch on rt back |
| 2 | 58 | Elumalai | Mc | 14 | N1 Nt |
| 3 | | Jayaraman | Mc | 13 | N1 Nt |
| 4 | | Varadarajan | Mc | 8 | N1 Nt |
| 5 | 60 | Elumalai | Mc | 10 | N1 Nt |
| 6 | 15 | Selvaraj | Mc | 10 | N1 Nt |
| 7 | Hut | Muniammal | Fc | 7 | Retrogressed Minor Tbd macule on rt buttock |
| 8 | Hut | Syed Iyed Basha | Mc | 14 | N1 Nt |
| | | *Samior Thottam* | | | |
| 9 | Hut | Mariammal | Fc | 8 | N1 Nt Major |
| 10 | | Sakuntala | Fc | 2 | N1 Ns |
| 11 | | Arumugham | Mc | 14 | L1 |
| 12 | | Annammal | Fc | 15 | L1 |
| 13 | | Palayam | Mc | 8 | N1 Nt |
| 14 | | Gengamuthu | Mc | 10 | N1 Ns |
| 15 | | Munuswamy | Mc | 8 | N1 Nt Major |
| 16 | | Kanniappan | Mc | 12 | N1 Nt |
| | | *Methodist Mission School* | | | |
| 17 | | Komala | Fc | 6 | N1 Ns (patch on rt buttock lateral) |
| 18 | | Kamala | Fc | 6 | N1 Ns (patch on rt forearm back) |
| 19 | | Jayam | Fc | 10 | N1 Ns (patch on rt leg lateral back) |
| 20 | | Jambak Thorai | Fc | 13 | N1 Nt |
| | | *Mosque Street* | | | |
| 21 | 3 | Anchalakshi | Fc | 6 | N1 Ns and N1 Nt (patch on rt knee and rt arm back) |
| 22 | 4 | Susheela Devi | Fc | 14 | Tbd patches all over the body |
| 23 | 15 | Kanniammal | Fc | 10 | N1 Ns |
| 24 | 28 | Vajiravelu | Mc | 3 | N1 Ns |
| 25 | 54 | Vadivelu | Mc | 7 | N1 Ns |
| | | *Subramania swami Koil East Lane* | | | |
| 26 | 10 | Saratha | Fc | 5 | N1 Ns |
| 27 | 11 | S D Sakuntala | Fc | 11 | N1 Ns |
| 28 | 13 | Kanniammal | Fc | 6 | N1 Nt |
| 29 | 2 | Jaya | Fc | 10 | N1 Ns |
| | | *Soundreswarar Koil Street* | | | |
| 30 | 16 | Devaki | Fc | 10 | N1 Nt |
| | | *Chetty Street* | | | |
| 31 | 12 | Chokkalingam | Mc | 14 | N1 Incipient |
| 32 | 38 | Kanakambiran | Mc | 1 | N1 Nt Minor |

is on Area C bounded on the north by Vadyar Subbaroya Mudali Street on the east by a part of Karneeswarar Koil Street on the south by Alandoor Road and on the west by Mosque Street The population is of a mixed type there are a few weaver families some dhobi families and a fairly good number of them are employed in offices in the city and other places

#### Main Occupation of the Population

There is no particularly predominant occupation A few weavers dhobies and others employed in offices

#### Water-supply and Drainage

Since the inception of protected water supply few of the wells in this area are sources of drinking water Well water is used mainly for washing purposes Drainage in common with other areas is mainly by cesspool collections and removal by carts

#### Diet

Staple diet is parboiled rice fish and mutton vegetables varying in quality and quantity according to the economic status of the families

#### Condition of Living

Unlike other areas of Saidapet there are a larger number of well to do families in this area Except in Alandoor Road and Mosque Street the number of families living in a house is rarely more than one or two Consequently there is less over crowding in this area

Secondly there is not that degree of free movement of the population amongst themselves as was found in Area A and B This is a favourable feature in this area for it gives less chance for leprosy to spread

#### State of Literacy and General Comment

Except in Alandoor Road and a few families in Mosque Street most of the people appear to be literate Many of them are employed and therefore on the whole in this area it appears that the condition of life is much better than in the other areas of Saidapet

#### State of Public Health

Filariasis scabies and skin diseases were frequently met with In Alandoor Road and Mosque Street there appears to be a larger prevalence of hookworm and round worm infections

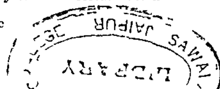
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There is a tendency in the better class families to keep secret the prevalence of leprosy in their families while in the poorer classes there is little fear of leprosy and therefore freer movement

#### History of Leprosy in the Area

As usual with the other areas this being an urban area no history of the disease can be ascertained Contact history can to a certain extent be satisfactorily traced

Silver Jubilee Children s Clinic
Dated 15th June 1945



## LIST OF CASES IN AREA C

### DEFINITE CASES

| Serial No | Door No | Name | Sex | Age | Remarks |
|---|---|---|---|---|---|
| | | *Alandoor Road* | | | |
| 1 | 57 | Varadan | Mc | 10 | Tbd patch on rt back |
| 2 | 58 | Elumalai | Mc | 14 | Nl Nt |
| 3 | | Jayaraman | Mc | 13 | Nl Nt |
| 4 | | Varadarajan | Mc | 8 | Nl Nt |
| 5 | 60 | Elumalai | Mc | 10 | Nl Nt |
| 6 | 15 | Selvaraj | Mc | 10 | Nl Nt |
| 7 | Hut | Muniammal | Fc | 7 | Retrogressed Minor Tbd macule on rt buttock |
| 8 | Hut | Syed Iyed Basha | Mc | 14 | Nl Nt |
| | | *Samior Thottam* | | | |
| 9 | Hut | Mariammal | Fc | 8 | Nl Nt Major |
| 10 | | Sakuntala | Fc | 2 | Nl Ns |
| 11 | | Arumugham | Mc | 14 | Ll |
| 12 | | Annammal | Fc | 15 | Ll |
| 13 | | Palayam | Mc | 9 | Nl Nt |
| 14 | | Gengamuthu | Mc | 10 | Nl Ns |
| 15 | | Munuswamy | Mc | 8 | Nl Nt Major |
| 16 | | Kanniappan | Mc | 12 | Nl Nt |
| | | *Methodist Mission School* | | | |
| 17 | | Komala | Fc | 6 | Nl Ns (patch on rt buttock lateral) |
| 18 | | Kamala | Fc | 6 | Nl Ns (patch on rt forearm back) |
| 19 | | Jayam | Fc | 10 | Nl Ns (patch on rt leg lateral back) |
| 20 | | Jambak Thoraisa | Fc | 13 | Nl Nt |
| | | *Mosque Street* | | | |
| 21 | 3 | Anchalakshi | Fc | 6 | Nl Ns and Nl Nt (patch on rt knee and rt arm back) |
| 22 | 4 | Susheela Devi | Fc | 14 | Tbd patches all over the body |
| 23 | 15 | Kanniammal | Fc | 10 | Nl Ns |
| 24 | 28 | Vajiravelu | Mc | 3 | Nl Ns |
| 25 | 54 | Vadivelu | Mc | 7 | Nl Ns |
| | | *Subramania swami Koil East Lane* | | | |
| 26 | 10 | Saratha | Fc | 5 | Nl Ns |
| 27 | 11 | S D Sakuntala | Fc | 11 | Nl Ns |
| 28 | 13 | Kanniammal | Fc | 6 | Nl Nt |
| 29 | 2 | Jaya | Fc | 10 | Nl Ns |
| | | *Soundreswarar Koil Street* | | | |
| 30 | 16 | Devaki | Fc | 10 | Nl Nt |
| | | *Chetty Street* | | | |
| 31 | 12 | Chokkalingam | Mc | 14 | Nl Incipient |
| 32 | 38 | Kanakambiran | Mc | 1 | Nl Nt Minor |

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**Main Occupation of the Population**

There is no particularly predominant occupation. A few weavers dhobies and others employed in offices.

**Water-supply and Drainage**

Since the inception of protected water supply few of the wells in this area are sources of drinking water. Well water is used mainly for washing purposes. Drainage in common with other areas is mainly by cesspool collections and removal by carts.

**Diet**

[illegible] ple diet is parboiled rice fish and mutton vegetables varying in quality and quantity according to the economic status of the families.

**Condition of Living**

Unlike other areas of Saidapet there are a larger number of well to do families in this [illegible]. Except in Alandoor Road and Mosque Street the number of families [illegible] is rarely more than one or two. Consequently there is less overcrowding in this area.

Secondly there is not that degree of free movement of the population amongst them [illegible] found in Area A and 'B. This is a favourable feature in this [illegible] chance for leprosy to spread.

**State of Literacy and General Comment**

Except in Alandoor Road and a few families in Mosque Street most of the people appear to be literate. Many of them are employed and therefore on the whole in this area it appears that the condition of life is much better than in the other areas of Saidapet.

**State of Public Health**

Filariasis scabies and skin diseases were frequently met with. In Alandoor Road and Mosque Street there appears to be a larger prevalence of hookworm and round worm infections.

**Leprosy Incidence**

There is a tendency in the better class families to keep secret the prevalence of leprosy in their families while in the poorer classes there is little fear of leprosy and therefore freer movement.

**History of Leprosy in the Area**

As usual with the other areas this being an urban area no history of the disease be ascertained. Contact history can to a certain extent be satisfactorily traced.

Silver Jubilee Children s Clinic
Dated 15*th June* 1945

## LIST OF CASES IN AREA C

### Definite Cases

| Serial No | Door No | Name | Sex | Age | Remarks |
|---|---|---|---|---|---|
| | *Alandoor Road* | | | | |
| 1 | 57 | Varadan | Mc | 10 | Tbd patch on rt back |
| 2 | 58 | Elumalai | Mc | 14 | Nl Nt |
| 3 | | Jayaraman | Mc | 13 | Nl Nt |
| 4 | | Varadarajan | Mc | 8 | Nl Nt |
| 5 | 60 | Elumalai | Mc | 10 | Nl Nt |
| 6 | 15 | Selvaraj | Mc | 10 | Nl Nt |
| 7 | Hut | Muniammal | Fc | 7 | Petrogressed Minor Tbd macule on rt buttock |
| 8 | Hut | Syed Iyed Basha | Mc | 14 | Nl Nt |
| | *Samior Thottam* | | | | |
| 9 | Hut | Mariammal | Fc | 8 | Nl Nt Major |
| 10 | | Sakuntala | Fc | | Nl Ns |
| 11 | | Arumugham | Mc | 14 | Ll |
| 12 | | Annammal | Fc | 15 | Ll |
| 13 | | Palayam | Mc | 8 | Nl Nt |
| 14 | | Gengamuthu | Mc | 10 | Nl Ns |
| 15 | | Munuswamy | Mc | 8 | Nl Nt Major |
| 16 | | Kanniappan | Mc | 12 | Nl Nt |
| | *Methodist Mission School* | | | | |
| 17 | | Komala | Fc | 6 | Nl Ns (patch on rt buttock lateral) |
| 18 | | Kamala | Fc | 6 | Nl Ns (patch on rt forearm back) |
| 19 | | Jayam | Fc | 10 | Nl Ns (patch on rt leg lateral back) |
| 20 | | Jambak Thoraisa | Fc | 13 | Nl Nt |
| | *Mosque Street* | | | | |
| 21 | 3 | Anchalakshi | Fc | 6 | Nl Ns and Nl Nt (patch on rt knee and rt arm back) |
| 22 | 4 | Susheela Devi | Fc | 14 | Tbd patches all over the body |
| 23 | 15 | Kanniammal | Fc | 10 | Nl Ns |
| 24 | 28 | Vajiravelu | Mc | 3 | Nl Ns |
| 25 | 54 | Vadivelu | Mc | 7 | Nl Ns |
| | *Subramaniaswami Koil East Lane* | | | | |
| 26 | 10 | Saratha | Fc | 5 | Nl Ns |
| 27 | 11 | S D Sakuntala | Fc | 11 | Nl Ns |
| 28 | 13 | Kanniammal | Fc | 6 | Nl Nt |
| 29 | 2 | Jaya | Fc | 10 | Nl Ns |
| | *Soundreswarar Koil Street* | | | | |
| 30 | 16 | Devaki | Fc | 10 | Nl Nt |
| | *Chetty Street* | | | | |
| 31 | 12 | Chokkalingam | Mc | 14 | Nl Incipient |
| 32 | 38 | Kanakambiran | Mc | 1 | Nl Nt Minor |

DEFINITE CASES—*continued*

| Serial No | Door No | Name | Sex | Age | Remarks |
|---|---|---|---|---|---|
| | *Bhujanga Rao Street* | | | | |
| 33 | 1 | Narasimham | Mc | 9 | N1 Ns |
| 34 | 8 | Dilli | Mc | 14 | L1 |
| 35 | | Elumalai | Mc | 12 | L1 |
| 36 | | Govindammal | Fc | 8 | N1 Incipient |
| 37 | | Kannan | Mc | 9 | N1 Incipient |
| 38 | | Saroja | Fc | 7 | N1 Nt |
| | *Brahmin Street* | | | | |
| 39 | 5 | Palani | Mc | 9 | N1 Ns |
| 40 | 8 | Natarajan (Police Lines) | Mc | 14 | N1 Nt |

DEFINITE CASES—ADULTS

| Serial No | Door No | Name | Sex | Age | Remarks |
|---|---|---|---|---|---|
| | *Alandoor Road* | | | | |
| 1 | 58 | Babu | M | 18 | N1 Nt Major (patch on rt elbow back) |
| 2 | | Arumugham | M | 18 | N1 Ns |
| 3 | | Kannia Pillai | M | 60 | N1 Ns |
| 4 | 60 | Natesan | M | 18 | N1 Ns |
| 5 | 66 | Kanniappa Naicker | M | 30 | N1 Ns |
| 6 | 15 | Purushothaman | M | 35 | N1 Ns |
| 7 | 17 | Krishnaswamy | M | 48 | Open case |
| | *Samior Thottam* | | | | |
| 8 | Hut | Munuswamy | M | 45 | N3 |
| 9 | | Gengan | M | 45 | N3 Ns |
| 10 | | Gengan | M | 35 | Big patch on rt shoulder back retrogressed |
| 11 | | Nagammal | F | 22 | N3 |
| | *Alandoor Road* | | | | |
| 12 | 22 | Dakshinamoorthy | M | 35 | L2 |
| 13 | | Vandimodu Saratha | F | 30 | Tbd (patch on rt elbow back) |
| | *Mosque Street* | | | | |
| 14 | 3 | Perumal Naidu | M | 20 | N2 Na (closed case) |
| 15 | 11 | Ranganayaki | F | 35 | N1 Ns (retrogressed Tbd lesion) |
| 16 | 20 | Kamalammal | F | 55 | N1 Ns |
| 17 | 24 | Angammal | F | 50 | N3 |
| 18 | 26 | Chinnammal | F | 30 | N1 Nt Minor |
| 19 | 27 | Murugesan | M | 20 | Old retrogressed Tbd lesion |
| 20 | | Kanniammal | F | 38 | N1 Ns |
| 21 | | Tirupati | M | 36 | L1 N3 |
| 22 | 28 | Krishnaswamy | M | 28 | L3 |
| 23 | | Mudichatammal | F | 50 | Tbd Minor (patch on lt shoulder) |
| 24 | 36 | Janikiammal | F | 35 | N1 Nt (patch on rt elbow back) |
| 25 | 48 | Kadumbadi | F | 30 | Tbd Minor |
| 26 | 55 | Gopal Naidu | M | 60 | Tbd patch retrogressed |

*Definite Cases—Adults—continued*

| Serial No | Door No | Name | Sex | Age | Remarks |
|---|---|---|---|---|---|
| | | *Subramania swami Koil Lane* | | | |
| 27 | 13 | Avlandammal | F | 38 | Tbd Minor (patch on lt forearm) |
| 28 | 2 | Arjunan | M | 17 | N1 Ns |
| | | *Soundreswarar Koil Street* | | | |
| 29 | 1 | Arumugha Mudaliar | M | 19 | N1 Ns |
| 30 | 19 | Kittappa Naidu | M | 40 | L3 |
| | | *Chetty Street* | | | |
| 31 | 12 | Cengadara Asari | M | 45 | L2 |
| 32 | 18 | Nagammal | F | 35 | N1 Ns |
| 33 | | Kannappan | M | 18 | L2 |
| 34 | | Kali | M | 17 | L1 |
| 35 | 27 | B S Niler | M | 35 | L3 |
| 36 | 38 | Kamalammal | F | 30 | N1 Nt |
| | | *Bhujanga Rao Street* | | | |
| 37 | 7 | Rajagopalan | M | 19 | N1 Ns |
| 38 | 20 | Ananda Rao | M | 37 | L2 |
| 39 | 21 | Ponnammal | F | 27 | N1 Ns |
| 40 | 8 | Kuppammal | F | | L1 |
| | | *Brahmin Street* | | | |
| 41 | 8 | Tyagarajan | M | 2[illegible] | N1 Nt (retrogressed) |
| | | *Police Lanes* | | | |
| 42 | 45 | Jayaraman | M | 38 | N1 Na |
| | | *Chetty Street—continued* | | | |
| 43 | 8 | Srinivasan | M | [illegible]1 | N1 Ns |

Schedule I

*District* Chingleput *Taluk* Saidapet *Village* Area C

| Total Population | Sex | Cases Detected | | | Incidence per 1 000 |
|---|---|---|---|---|---|
| | | Neural | Lepromatous | Total | |
| 1 [illegible]97 | Males | 37 | 13 | 50 | 30 86 |
| 1 39[illegible] | Females | 31 | 2 | 33 | 23 5[illegible] |
| [illegible]89 | Total | 68 | 15 | 83 | |

DEFINITE CASES—*continued*

| Serial No | Door No | Name | Sex | Age | Remarks |
|---|---|---|---|---|---|
| | | *Bhujanga Rao Street* | | | |
| 33 | 1 | Narasimham | Mc | 9 | N1 Ns |
| 34 | 8 | Dilli | Mc | 14 | L1 |
| 35 | | Elumalai | Mc | 12 | L1 |
| 36 | | Govindammal | Fc | 8 | N1 Incipient |
| 37 | | Kannan | Mc | 9 | N1 Incipient |
| 38 | | Saroja | Fc | 7 | N1 Nt |
| | | *Brahmin Street* | | | |
| 39 | 5 | Palani | Mc | 9 | N1 Ns |
| 40 | 8 | Natarajan (Police Lines) | Mc | 14 | N1 Nt |

DEFINITE CASES—ADULTS

| Serial No | Door No | Name | Sex | Age | Remarks |
|---|---|---|---|---|---|
| | | *Alandoor Road* | | | |
| 1 | 58 | Babu | M | 18 | N1 Nt Major (patch on rt elbow back) |
| 2 | | Arumugham | M | 18 | N1 Ns |
| 3 | | Kannia Pillai | M | 60 | N1 Ns |
| 4 | 60 | Natesan | M | 18 | N1 Ns |
| 5 | 66 | Kanniappa Naicker | M | 30 | N1 Ns |
| 6 | 15 | Purushothaman | M | 35 | N1 Ns |
| 7 | 17 | Krishnaswamy | M | 48 | Open case |
| | | *Samior Thottam* | | | |
| 8 | Hut | Munuswamy | M | 45 | N3 |
| 9 | | Gengan | M | 45 | N3 Ns |
| 10 | | Gengan | M | 35 | $B_{1_o}$ patch on rt shoulder back retrogressed |
| 11 | | Nagammal | F | 22 | N3 |
| | | *Alandoor Road* | | | |
| 12 | 22 | Dakshinamoorthy | M | 35 | L2 |
| 13 | | Vandimodu Saratha | F | 30 | Tbd (patch on rt elbow back) |
| | | *Mosque Street* | | | |
| 14 | 3 | Perumal Naidu | M | 20 | N2 Na (closed case) |
| 15 | 11 | Panganayaki | F | 35 | N1 Ns (retrogressed Tbd lesion) |
| 16 | 20 | Kamalammal | F | 55 | N1 Ns |
| 17 | 24 | Angammal | F | 50 | N3 |
| 18 | 26 | Chinnammal | F | 30 | N1 Nt Minor |
| 19 | 27 | Murugesan | M | 20 | Old retrogressed Tbd lesion |
| 20 | | Kanniammal | F | 38 | N1 Ns |
| 21 | | Tirupati | M | 36 | L1 N3 |
| 22 | 28 | Krishnaswamy | M | 28 | L3 |
| 23 | | Mudichatammal | F | 50 | Tbd Minor *(patch on lt shoulder)* |
| 24 | 36 | Janikiammal | F | 35 | N1 Nt (patch on rt elbow back) |
| 25 | 48 | Kadumbadi | F | 30 | Tbd Minor |
| 26 | 55 | Gopal Naidu | M | 80 | Tbd patch retrogressed |

DEFINITE CASES—ADULTS—*continued*

| Serial No | Door No | Name | Sex | Age | Remarks |
|---|---|---|---|---|---|
| | *Subramania swami Koil Lane* | | | | |
| 27 | 13 | Avlandammal | F | 38 | Tbd Minor (patch on lt forearm) |
| 28 | 2 | Arjunan | M | 17 | N1 Ns |
| | *Soundreswarar Koil Street* | | | | |
| 29 | 1 | Arumugha Mudaliar | M | 19 | N1 Ns |
| 30 | 19 | Kistappa Naidu | M | 40 | L3 |
| | *Chetty Street* | | | | |
| 31 | 12 | Gengadara Asari | M | 45 | L2 |
| 32 | 18 | Nagammal | F | 35 | N1 Ns |
| 33 | | Kanniappan | M | 18 | L2 |
| 34 | | Kali | M | 17 | L1 |
| 35 | 27 | B S Niler | M | 35 | L3 |
| 36 | 39 | Kamalammal | F | 30 | N1 Nt |
| | *Bhujanga Rao Street* | | | | |
| 37 | 7 | Rajagopalan | M | 19 | N1 Ns |
| 38 | 20 | Ananda Rao | M | 37 | L2 |
| 39 | 21 | Ponnammal | F | 27 | N1 Ns |
| 40 | 8 | Kuppammal | F | | L1 |
| | *Brahmin Street* | | | | |
| 41 | 8 | Tyagarajan | M | 22 | N1 Nt (retrogressed) |
| | *Police Lines* | | | | |
| 42 | 45 | Jayaraman | M | 38 | N1 Na |
| | *Chetty Street—continued* | | | | |
| 43 | 28 | Srinivasan | M | 21 | N1 Ns |

SCHEDULE I

*District* Chingleput *Taluk* Saidapet *Village* Area C

| Total Population | Sex | Cases Detected | | | Incidence per 1,000 |
|---|---|---|---|---|---|
| | | Neural | Lepromatous | Total | |
| 1,297 | Males | 37 | 13 | 50 | 30.8[illegible] |
| 1,392 | Females | 31 | 2 | 33 | 23.5[illegible] |
| 2,689 | Total | 68 | 15 | 83 | |

ANALYSIS OF CASES BY TYPE AND AGE

| Age Group | Cases | | | | Total for Age Group | Percent of Tot Cases |
|---|---|---|---|---|---|---|
| | Neural | | Lepromatous | | | |
| | No | Percentage | No | Percentage | | |
| 0–14 | 36 | 90 0 | 4 | 10 0 | 40 | 48 2 |
| 15–34 | 17 | 85 0 | 3 | 15 0 | 20 | 24 1 |
| Over 34 | 15 | 65 2 | 8 | 34 8 | 23 | 27 7 |
| Total | 68 | 80 6 | 15 | 19 9 | 83 | 100 0 |

## II LEPROSY SURVEY OF AREA B SAIDAPET 1942

### Situation

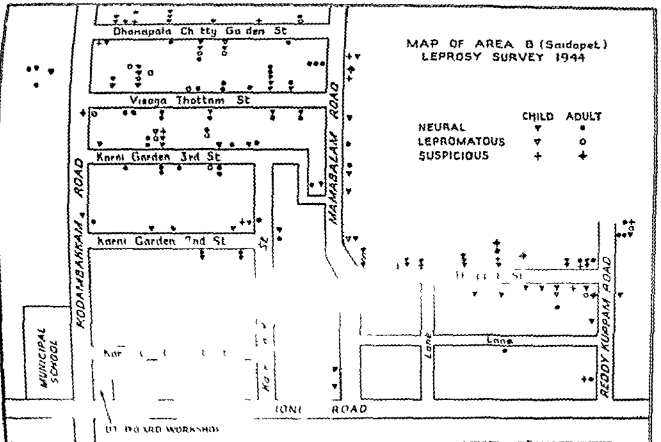
This is a part of the Saidapet town situated about six miles south of Fort St Ge on the main trunk road to the south This suburb of Madras is a town of a popula of about 40 000 Though the municipal limits are extensive the town proper is al one and a half miles by one mile and this is the most thickly populated area population in this part of the Saidapet Municipality is roughly estimated to be al 10 000 *This area for purposes of leprosy survey was divided into five smaller a* and called Area A B C D and Fenpet and Edapallayam area This rep is on the survey of Area B The population is mainly weavers The weav community is named the Senguntha mudaliar community

### Main Occupation of the Population

The chief occupation of the population is weaving while dyeing and cloth print with fanciful designs are also carried on by a few The chief member in a househ is the owner of handlooms employing many others as wage earners under him

### Water supply and Drainage

Drinking water was from wells for years long past and in 1939 protected wat supply was introduced by the Municipality Very few house connections are giv so much so the population depends largely on public taps Each public tap is much crowded during the water supply hours that in and around a public tap f and dirty water are common sights The problem of drainage has been the curse Saidapet Drain water is collected in cesspools located behind a house where th happens to be a sanitary lane or in front of houses in the main streets affording most contemptible sight to the passer by The cesspools often overflow Unless problem of drainage is tackled Saidapet cannot come anywhere near a fit place living Situated as it is so near Madras the health of the city is bound to be affec


MAP OF AREA B (Saidapet)
LEPROSY SURVEY 1944
CHILD
ADULT
NEURAL
LEPROMATOUS
SUSPICIOUS
Dhanapala Ch tty Ga den St
Visaga Thottam St
Karni Garden 3rd St
Karni Garden 2nd St
MAMBALAM ROAD
KODAMBAKKAM ROAD
REDDY KUPPAM ROAD
MUNICIPAL SCHOOL
Lane
Lane
ROAD

by the unhygienic conditions of its suburbs Several attempts were made to institute underground drainage systems in the municipality and when active measures were begun to tackle this problem the war came with the result that all schemes were shelved compulsorily for the duration of the war It is hoped after the war the attempts will be renewed

### Diet

*The staple diet is parboiled rice Ragi Khoozhu vegetables mutton and fish* these ranging in quality and quantity according to the economic status of families Most of the *families are poor In a diet survey carried on in this area by the Nutrition* Institute Coonoor it was found that the average consumption of diet in calories was lower than normal and ranged from 900 to 2 350 *calories*

### Conditions of Living

The poor economic condition is largely contributing to the fact of several families living in the same house as co tenants There are a number of families living in the same house varying from three to six or seven When a survey worker gets into a house it is a deplorable sight to see a number of children and adults moving about in the house and he feels that it is no wonder an open case in their midst is a potent source of infection to many of the children and perhaps to some of the adults

Further in this area as in Area A the movement of the people from place to place in the course of their weaving work and the shifting of residences is very frequent Belonging to the same community they mix up freely The chances of spread of leprosy in these areas are very great even if only a few open cases are present This *is probably the cause of the high incidence in this area as well as in Area A*

### State of Literacy and General Comment

The majority of the population is illiterate That leprosy is infectious few of them know *This is an area from which several child patients come* This has given us occasions to put into the minds of their families the right type of ideas about leprosy After some years of work some of these families now realise the infectivity of leprosy but it is not strong enough to adopt measures of segregation if the patient concerned is his own close relation But there is considerable anxiety to take treatment as an alternative to segregation At any rate though defective in itself from the point of view of prevention yet it appears to be a healthier outlook on leprosy The co operation of the public for a leprosy survey has been uniformly good

### State of *Public Health*

Hook worm and round worm infections are very common among children in this area Scabies and fungus *are also largely prevalent* Hygiene both personal and public is little in evidence Any epidemic such as the chicken pox or smallpox or cholera *finds easy and fertile* soil in this area when once it starts Filariasis is very common

### Leprosy Conscience

People recognise leprosy even at early stages This is evidenced by the fact that 63 72 per cent of the children found to be showing manifestations of leprosy in this

area during the survey were registered even prior to the survey by voluntary presentation Some of our very early cases are from this area In that way it is gratifying to note that a better knowledge about leprosy has been gained by the population We hope this is a first step towards the ideal of segregation of open cases

**History of Leprosy in the Area**

*No antecedent* history of leprosy is possible to trace as this is an urban area with a constantly changing or moving population Attempts are constantly maintained in this direction There are several instances of a successful tracing of the contact history in this area several days or months after admission

Silver Jubilee Children s Clinic
Dated 11*th April* 1944

## LIST OF CASES IN AREA B

CHILDREN

| Serial No | Door No | Name | Age | Sex | Remarks | |
|---|---|---|---|---|---|---|
| | | *Karni Gardens—Straight Street* | | | | |
| 1 | Hut | Lakshmi | 10 | Fe | Suspicious | 654 |
| 2 | 16 | Visalakshi | 8 | Fe | N1 Nt Minor | 235 |
| 3 | 8 | Manivelu | 10 | Me | N1 Nt Major | 294 |
| 4 | | Saraswathy | 11 | Fe | Suspicious | 670 |
| 5 | 19 | Thulukanam | 12 | Me | N1 Ns | 168 |
| | | *Karni Gardens—First Street* | | | | |
| 6 | 13 | Angammal | 10 | Fe | N1 Nt Minor | 410 |
| | | *Karni Gardens—Second Street* | | | | |
| 7 | 1 | Natarajan | 10 | Me | N1 Nt Minor | 239 |
| 8 | | Lalani | 8 | Me | N1 Nt Minor | 42 |
| 9 | | Velayutham | 12 | Me | N1 Ns | 43 |
| 10 | 8 2 | Hamsaveni | [illegible] | Fe | N1 Ns | 650 |
| 11 | 11 | Vaduvambal | 13 | Fe | N1 Ns (patch on shoulder) | |
| 12 | 21 | Gengan | 13 | Me | Patch on lt shoulder | |
| | | *Karni Gardens—Third Street* | | | | |
| 13 | Hut | Varadarajan | 12 | Me | N1 Ns | [illegible] |
| 14 | Hut | Sivagami | 12 | Fe | N1 Ns | 33 |
| 15 | | Ponnivelu | 14 | Me | N1 Ns | 317 |
| 16 | | Thangavelu | 6 | Me | Suspicious | [illegible] |
| 17 | | Lakku | 8 | Fe | L1 (negative) | 34 |
| 18 | Hut | Kanmammal | 7 | Fe | N1 Nt | [illegible] |
| 19 | Hut | Panchaksaram | 8 | Me | N1 Nt Minor | 402 |
| | | *Kodambakkam High Road* | | | | |
| 20 | 6 | Chinnaponnu | 4 | Fe | N1 Ns | [illegible] |
| 21 | 11 | Jakiri | 7 | Fe | Suspicious | 37 |
| 22 | Hut | Parvathy | 12 | Fe | N1 Ns | 610 |

CHILDREN—*continued*

| Serial No | Door No | Name | Age | Sex | Remarks | |
|---|---|---|---|---|---|---|
| | | ***Dhanapal Chetty Gardens*** | | | | |
| 23 | 3 | Elumalai | 12 | Mc | N1 Ns | |
| 24 | 2 | Natarajan | 8 | Mc | Suspicious | 55 A |
| 25 | 11 | Jayaraman | 4 | Mc | N1 Nt Minor | 653 |
| 26 | | Subbammal | 1 | Fc | N1 Ns | |
| 27 | Hut | Somasundaram | 14 | Mc | L1 (negative) | 160 |
| 28 | | Murugesan | 10 | Mc | N1 Nt Minor | 387 |
| 29 | 10 | Krishnan | 10 | Mc | Suspicious | 320 |
| 30 | 9 | Manickkam | 8 | Mc | N1 Ns | 80 |
| 31 | 6/2 | Kannammal | 13 | Fc | L1 | 313 |
| 32 | | Baby | 9 | Fc | N1 Ns | 315 |
| 33 | | Kamala | 6 | Fc | N1 Nt Minor | 418 |
| 34 | 5 | Rangiah | 12 | Mc | Suspicious | 559 |
| 35 | | Sarojini | 9 | Fc | N1 Ns | 547 |
| 36 | 4 | Vaduvambal | 4 | Fc | N1 Nt (patch on rt forearm) | |
| 37 | | Saroja | 6 | Fc | N1 Nt | |
| | | ***Visagathottam*** | | | | |
| 38 | 10 | Kamakshee | 8 | Fc | N1 Ns | 208 |
| 39 | 5 | Parthasarathy | 8 | Mc | N1 Nt Major | 422 |
| 40 | 2 | Tirupuram | 7 | Fc | N1 Ns | |
| 41 | 46 | Elangali | 7 | Mc | N1 Nt Minor | 612 |
| 42 | 43 | Manickkam | 12 | Mc | N1 Nt Major | 198 |
| 43 | | Saradhambal | 7 | Fc | N1 Nt | 249 A |
| 44 | | Murugathammal | 10 | Fc | N1 Nt | |
| 45 | Hut | Sundaram | 12 | Mc | L1 | 632 |
| 46 | | Vaduvambal | 10 | Fc | N1 Ns | 528 A |
| 47 | | Ramachandran | 6 | Mc | N1 Ns | 649 |
| 48 | Hut | Elumalai | 7 | Mc | N1 Ns | |
| 49 | 26 | Panchaksaram | 14 | Mc | N1 Nt Minor | 164 A |
| 50 | | Pachaiammal | 10 | Fc | N1 Ns | 672 |
| | | ***Old Mambalam Road*** | | | | |
| 51 | 3 | Kamala | 13 | Fc | N1 Nt Minor | 483 |
| 52 | 5 | Ganesan | 8 | Mc | N1 Ns | 577 |
| 53 | 11 | Dhanalakshmi | 8 | Fc | N1 Ns | 3 A |
| 54 | | Vydyalingam | 6 | Mc | Typical patch rt abdomen | |
| 55 | 13 | Bangaruswamy | 5 | Mc | Patch on lt knee more typical than suspicious | |
| 56 | 17 | Logammal | 7 | Fc | Suspicious patch rt shoulder back | |
| 57 | 18 | Arunagiri | 10 | Mc | L1 (border line) | 379 |
| 58 | | Devakunjari | 12 | Fc | L1 | 378 |
| 59 | 21 | Saroja | 8 | Fc | N1 Ns | 644 |
| 60 | 48 | Varadan | 8 | Mc | Suspicious | 473 |
| 61 | | Parthasarathy | 10 | Mc | N1 Nt Minor | 436 |
| 62 | 56 | Chandra | 9 | Fc | Suspicious | 553 |
| 63 | 61 | Kamala | 6 | Fc | N1 Nt Minor | 85 A |
| 64 | 66 | Ganesan | 6 | Mc | N1 Ns | 1 A |
| 65 | 71 | Velayutham | 12 | Mc | N1 Nt Minor | 210 |
| 66 | 72 | Arumugham | 14 | Mc | L1 | 134 |
| 67 | | Devanayakiammal | 4 | Fc | N1 Nt Minor | 487 |

CHILDREN—*continued*

| Serial No | Door No | Name | Age | Sex | Remarks | |
|---|---|---|---|---|---|---|
| | *Thoppet Street* | | | | | |
| 68 | 41 | Parvathy | 14 | Fc | Nl Ns | 73 A |
| 69 | | Angammal | 9 | Fc | Ll | 38 A |
| 70 | | Savandammal | 12 | Fc | Ll | 49 A |
| 71 | | Chinnarajalu | 8 | Mc | Patch on rt thigh back | 96 A |
| 72 | 42 | Saroja | 6 | Fc | Patch on rt thigh back | |
| 73 | 45 | Parvathy | 5 | Fc | Suspicious | 676 |
| 74 | | Kanakasabai | 7 | Mc | Nl Ns | 182 A |
| 75 | 46 | Dakshinamoorthy | 10 | Mc | Patch on rt scapula | |
| 76 | | Sakuntala | 7 | Fc | Nl Nt Minor | 574 |
| 77 | [illegible] | Shanmugha undaram | 12 | Mc | Nl Ns | 146 |
| 78 | 56 | Patnavelu | 10 | Mc | Nl Nt Minor | 244 |
| 79 | | Balu | 9 | Mc | Nl Nt Minor | 247 |
| 80 | | Shunmugham | 14 | Mc | Nl Ns | [illegible] |
| 81 | 60 | Angamuthu | 14 | Mc | Nl Ns | 218 |
| 82 | | Shanmughasundaram | 12 | Mc | Suspicious | |
| 83 | 72 | Navaneetham | 13 | Fc | Tbd Minor | 177 A |
| 84 | | Pamalingam | 10 | Mc | Nl Nt | 185 A |
| 8 | 73 | Lakshmi | 10 | Fc | Nl Nt | 625 |
| 86 | 74 | Tirupuram | 5 | Fc | Suspicious | |
| 87 | 76 | Pattammal | 7 | Fc | Nl Nt Minor | 236 A |
| 88 | | Lakshmi | 14 | Fc | Nl Ns | 496 |
| 89 | 2 | Kanniappan | 9 | Mc | Nl Ns | |
| 90 | 5 | Pukku | 11 | Fc | Suspicious | |
| 91 | 9 | Janaki | 4 | Fc | Nl Nt Minor | 217 A |
| 92 | | Lingam | 14 | Mc | Ll | 21 A |
| 93 | 10 | Natarajan | 10 | Mc | Nl Ns | 2[illegible]0 |
| 94 | 11 | Sivalingam | 8 | Mc | Nl Nt Major | 645 |
| 95 | 13 | Nayagam | 10 | Fc | Nl Nt Major | 420 |
| 96 | 16/17 | Nandagopal | 6 | Mc | Nl Nt | 189 A |
| 97 | | Ranganathan | 9 | Mc | Nl Ns | 183 A |
| 98 | 21 | Sambandan | 8 | Mc | Nl Nt Minor | 113 A |
| 99 | | Ramalingam | [illegible] | Mc | Patch on lt thigh | |
| 100 | 33 | Ellammal | 10 | Fc | Nl Ns (border line) | 642 |
| 101 | 37 | Kanniammal | 13 | Fc | Patch on lt forearm | |
| 102 | 35 | Subramaniam | 10 | Mc | Nl Nt Minor | [illegible]11 |
| | *Reddikuppam Road* | | | | | |
| 103 | 2 | Shanmugham | 10 | Mc | Suspicious | 204 A |
| 104 | 5 | Venkatesan | 6 | Mc | Tbd Minor lt buttock | |
| 105 | 9 | Subramaniam | 4 | Mc | Patch rt thigh front (suspicious) | |
| 106 | | Killiammal | 11 | Fc | Patch on rt leg back | |
| 107 | 18 | Swaminathan | 12 | Mc | Nl Ns | 329 |

| | Mc | Fc | | |
|---|---|---|---|---|
| Definite cases | 49 | 42 | Total | 91 |
| Suspicious cases | 8 | 8 | Total | 16 |
| | 57 | 50 | | 107 |

## LIST OF CASES IN AREA B

ADULTS

| Serial No | Door No | Name | Age | Sex | Remarks |
|---|---|---|---|---|---|
| | | *Karni Gardens—Straight Street* | | | |
| 1 | 15 | Lakshmi | 35 | F | Tbd Major (patch on rt elbow) |
| 2 | 8 | Arumugha Mudaliar | 35 | M | N1 Ns |
| 3 | 22 | Balusami | 32 | M | N1 Ns |
| 4 | | Balakrishnan | 23 | M | N1 Ns |
| | | *Karni Gardens—First Street* | | | |
| 5 | 3 | Thangavelu Naicker | 38 | M | Tbd Minor |
| 6 | 13 | Guruviah Chetty | 40 | M | N1 Nt |
| 7 | | Gengammal | 32 | F | N1 Ns |
| | | *Karni Gardens—Second Street* | | | |
| 8 | 1 | Muniammal | 34 | F | N2 |
| 9 | 8/2 | Veerasami Naidu | 34 | M | N1 Ns |
| 10 | 14 | Rajammbal | 34 | F | N1 Ns (closed case) |
| | | *Karni Gardens—Third Street* | | | |
| 11 | 2 | Govindarajulu | 45 | M | N1 Ns |
| 12 | | Nagammal | 40 | F | N1 Ns |
| 13 | 3 | Munuswamy Naiker | 45 | M | L2 |
| 14 | 5 | Swarnambal | 18 | F | N1 Ns |
| 15 | 7 | Ramaswamy Mudaliar | 50 | M | Tbd Minor |
| 16 | | Madurai Naicker | 59 | M | Tbd Minor |
| 17 | 10 | Govinda Mudaly | 32 | M | N1 Ns |
| 18 | 14 | Tirunavukarasu | 18 | M | L1 (negative) |
| 19 | 13 | Venkatammal | 25 | F | N1 Ns (patch on lt elbow and rt leg) |
| 20 | [illegible] | Kanniah Naidu | 35 | M | Tbd Minor |
| 21 | 18 | Kadirvelu Mudaliar | 48 | M | N1 Nt Minor |
| 22 | 22 | Chinnappan | 20 | M | N1 Nt |
| | | *Kodambakkam High Road* | | | |
| 23 | 2 | Govindaswamy | 40 | M | N1 Ns |
| 24 | 8 | Kanniah Maistry | 35 | M | N1 Ns |
| 25 | 11 | Adiammal | 40 | F | L1 |
| 26 | Hut | Balakrishnan | 30 | M | N2 Ns |
| 27 | Hut | Kannammal | 45 | F | N3 |
| 28 | Hut | Lakshmi | 23 | F | N1 Ns |
| | | *Dhanapal Chetty Gardens* | | | |
| 29 | 2 | Kanniappa Mudar | 40 | M | [illegible] Minor |
| 30 | 11 | Subbaroya Chetty | | | |
| 31 | | Lakshmanammal | | | |
| 32 | 8 | Lakshmi | | | |
| 33 | Hut | Arumugham | | | |

ADULTS—*continued*

| Serial No | Door No | Name | Age | Sex | Remarks |
|---|---|---|---|---|---|
| | | *Dhanapal Chetty Gardens*—continued | | | |
| 34 | 13 | Subramaniam | 30 | M | Tbd Minor |
| 35 | 16 | Radha Bai | 35 | F | L1 (negative) |
| 36 | | Vel Murugappan | 30 | M | N1 Ns (patch rt hip) |
| 37 | 5 | Doraiswamy Naidu | 48 | M | Tbd Minor |
| 38 | 4 | Subramaniam | 30 | M | Tbd Minor |
| | | *Visagathottam* | | | |
| 39 | 20 | Papathy ammal | 35 | F | Patch on rt hand elbow |
| 40 | Hut | Kamakshee ammal | 50 | F | N1 Ns |
| 41 | 15 | Damodaram | 18 | M | Patch rt back side |
| 42 | | Parvathy ammal | 25 | F | N1 Ns |
| 43 | Hut | Rajammal | 45 | F | N1 Nt (patch on lt back) |
| 44 | | Perumal | 20 | M | L2 (died) |
| 45 | 10 | Venu Naicker | 40 | M | N2 |
| 46 | 5 | Varadarajalu Naicker | 30 | M | N1 Ns |
| 47 | 2 | Manickka Mudaly | 52 | M | N1 Ns |
| 48 | 46 | Munuswami Naicker | 35 | M | N1 Ns |
| 49 | 43 | Dhanabaghyam | 35 | F | N1 Ns |
| 50 | | Alagamma | 35 | F | Tbd Minor |
| 51 | 41 | Kandaswamy | 25 | M | N1 Ns |
| 52 | 39 | Ammakannu | 48 | F | N1 Ns (patch on rt cheek) |
| 53 | | Arunachallam | 18 | M | N1 Nt |
| 54 | 36 | Muthammal | 50 | F | N1 Ns |
| 55 | 30 | Kannappa Devan | 55 | M | L1 |
| 56 | Hut | Ratnam | 38 | M | L1 |
| 57 | Hut | Jayaram Naicker | 50 | M | L1 |
| | | *Old Mambalam Road* | | | |
| 58 | 11 | Kristappa Chetty | 58 | M | N2 Ns |
| 59 | 12 | Doraiswami Naicker | 30 | M | N1 Ns |
| 60 | 21 | Lakshmi | 45 | F | N1 Nt |
| 61 | Hut | Munuswamy Naidu | [illegible] | M | N1 Ns |
| 62 | 34 | Subbammal | 40 | F | N1 Ns |
| 63 | Hut | Kuppan | 25 | M | N1 Ns |
| 64 | 52 | Kumaraswami Pillai | 45 | M | N1 Ns (suspicious) |
| 65 | Hut | Shanmugham | 25 | M | N1 Ns |
| 66 | 51 | Kanakamma | 55 | F | N1 Ns |
| | | *Thoppet Street* | | | |
| 67 | 4[illegible] | Govinda Chetty | 40 | M | N1 Ns (patch) |
| 68 | 44 | Subramaniam | 18 | M | Tbd Minor rt ear lobe (suspicious) |
| 69 | 50 | S. V. Manikka Mudaliar | 28 | M | L1 |
| 70 | | Valliammal | 40 | F | N1 Nt Minor |
| 71 | | Rubavathy ammal | 20 | F | Suspicious |
| 72 | 52 | Annapoorni | 16 | F | L1 |
| 73 | 56 | Kannappan | 15 | M | N1 Nt |

ADULTS—*continued*

| Serial No | Door No | Name | Age | Sex | Remarks |
|---|---|---|---|---|---|
| | | *Thoppet Street*—continued | | | |
| 74 | 57 | Dakshinamoorthy | 17 | M | L1 |
| 75 | 60 | Appavoo Mudali | 31 | M | N1 Ns |
| 76 | | Balakrishnan | 18 | M | Suspicious |
| 77 | 62 63 | Sambadan | 17 | M | Suspicious |
| 78 | 64 | Kamakshee | 40 | F | N1 Ns |
| 79 | 75 | Elumalai | 20 | M | N1 Ns |
| 80 | 79 | Kamalvee | 44 | F | N1 Ns |
| 81 | 80 | Appavoo Chetty | 40 | M | N1 Ns |
| 82 | 2 | Abalu Chetty | 40 | M | L1 |
| 83 | 1 | Ethirajalu Naicker | 56 | M | N3 |
| 84 | | Ekambara Naicker | 35 | M | N1 Ns (suspicious) |
| 85 | 9 | Lakshmanan | 20 | M | N1 Ns |
| 86 | | Munuswamy | 30 | M | N1 Ns |
| 87 | 13 | Dhanabaghyam | 16 | F | N1 Ns |
| 88 | 14 | Vedagiri | 18 | M | N1 Nt Major |
| 89 | | Kuppu Chetty | 35 | M | N1 Ns |
| 90 | 16 | Vedachallam | 22 | M | L1 |
| 91 | 23 | Srinivasan | 30 | M | N1 Nt Minor |
| 92 | 24 25 | Murugesa Mudaliar | 30 | M | *Patch on rt shoulder* |
| 93 | 28 | Munuswamy Mudaliar | 30 | M | Tbd Minor (suspicious) |
| 94 | 33 | Parvathy | 50 | F | N1 Ns |
| 95 | 35 | Natesan | 25 | M | Tbd Minor |
| 96 | 37 | Tholasi Naicker | 35 | M | L1 |
| 97 | | Jambulinga Chetty | 26 | M | N1 Ns |
| 98 | 17 (back) | Arunachallam | 50 | M | N1 Ns |
| | | *Reddikuppam Road* | | | |
| 99 | 2 | Govindammal | 35 | F | N1 Ns |
| 100 | 9 | Pavadai | 38 | M | N1 Ns |
| 101 | | Kannan *alias* Munuswamy | 25 | M | N1 Ns |
| 102 | | Kanniah Naidu | 30 | M | Tbd Minor lt cheek |
| 103 | | Arumugham | 32 | M | N1 Nt Minor |
| 104 | | Palani | 25 | M | Open case |
| 105 | | Dakshinamoorthy | 22 | M | N1 Ns |
| | | *Thoppet Street—continued* | | | |
| 106 | 73 | Manickkammal | 25 | F | Suspicious |
| 107 | | Kamakshee | 17 | F | N1 Ns |

| | M | F | | |
|---|---|---|---|---|
| Definite cases | 67 | 33 | Total | 100 |
| Suspicious cases | 6 | 1 | Total | 7 |
| | 73 | 34 | | 107 |

## SURVEY TYPE I and II

### SCHEDULE I

*District* Chingleput *Taluk* Saidapet *Village* Area B

| Total Population | Sex | Cases Detected | | | Incidence per 1,000 |
|---|---|---|---|---|---|
| | | Neural | Lepromatous | Total | |
| 1 650 | Males | 101 | 17 | 118 | 60.4 |
| 1 508 | Females | 64 | 9 | 73 | |
| 3 158 | Total | 165 | 26 | 191 | |

### ANALYSIS OF CASES BY TYPE AND AGE

| Age Group | Cases | | | | Total for Age Group | Percentage of Total Cases |
|---|---|---|---|---|---|---|
| | Neural | | Lepromatous | | | |
| | No | Percentage | No | Percentage | | |
| 0-14 | 82 | 90.1 | 9 | 9.9 | 91 | 47.6 |
| 15-34 | 38 | 80.9 | 9 | 19.1 | 47 | 24.7 |
| Over 34 | 45 | 84.9 | 8 | 15.1 | 53 | 27.7 |
| Total | 165 | 86.3 | 26 | 13.7 | 191 | 100.0 |

## III REPORT OF LEPROSY SURVEY OF (KALAMPATU) MOTTUR VILLAGE IN NORTH ARCOT DISTRICT

### Situation of the Village

This is a small village consisting of a single street with a total population of 3[illegible]5. It is situated in a valley between two hills and is about five and a half miles from the village Latteri within five miles of Katpadi a railway station on the main Madras Bangalore line From Latteri the approach to the village is by a crude country cart route which leads up to another village Kalampatu From the last village one has to walk about three quarters of a mile through fields

**Main Occupation in the Village**

Agriculture and illicit distillation of ' Arrack The latter is largely for the villagers own use and clandestine sale to outlying villages

**Climate**

Dry area with a relative low temperature during nights

**Water-supply**

From wells most of which are used for irrigation purposes

**Leprosy Conscience**

The late forms of the disease are recognised but the early manifestations of the disease are ignored There seems to be considerable knowledge of leprosy The weekly ambulance of the Missionary Medical College Hospital stops at Latteri and as a result *some propaganda has been done and patients treated*

**Diet**

The staple diet is chiefly Pagi Cholam (local grains) occasionally vegetables buttermilk etc Rice is not strangely enough the staple diet The former grains are of fair nutritive value and better than rice

**Prevalence of Skin Diseases**

Dermatitis scabies and fungus infection of the skin are common

**Leprosy Statistics**

| | Adults and Children | | | Adults | | | Children | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | M | F | Total | M | F | Total | M | F |
| Population | 325 | 172 | 153 | 234 | 124 | 110 | 91 | 48 | 43 |
| Number examined | 314 | 168 | 146 | 227 | 122 | 105 | 87 | 46 | 41 |
| Number of leprosy cases | 39 | 25 | 14 | 26 | 16 | 10 | 13 | 9 | 4 |

| | |
|---|---|
| Percentage of population examined | 96 6% |
| Gross incidence | 124 per 1 000 |
| Sex incidence | 14 9% males<br>9 6% females |
| Child incidence | 14 94% |
| Sex rate | 64 1% |
| Child rate | 33 3% |
| Open case rate | 30 77% (this included open cases (2) died within two years) |
| Suspicious cases | Total 3 (2 adults and 1 child) |

DEFINITE CASES

| | N1 Ns | N1 Nt | Lepromatous | N Incipient |
|---|---|---|---|---|
| Adults | 11 | 6 | 9 | Nil |
| Children | 6 | 6 | 1 | Nil |

**Interesting Features of the Survey**

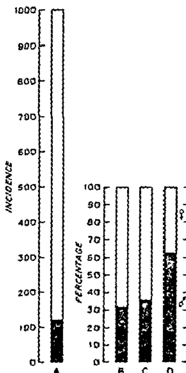
(a) The incidence of open cases in a small population of 325 is rather strikingly high

(b) The absence of serious lesions in children was an interesting feature The tuberculoid case invariably showed a considerable degree of resolution They were of the band like variety described by Dr Wade and others in a study of leprosy in Ceylon Nerve enlargement was uncommon in one instance only was this present

(c) The distribution of cases was mostly around limited foci of infection and where lepromatous cases were found to reside or have resided

**Leprosy History and Distribution of Cases in the Village**

About twenty years back the only person who had leprosy in the village was said to be the father (dead) of Rengan residing in house No 25 (see map) The open case—Narayanaswami Chetty—in house No 30 developed it later Peddappa another open case is the son of Narayanaswami Chetty The second focus was house No 1 where the husband of one Cajarammal (recently died) had leprosy Cajarammal also developed leprosy both are said to be open cases The third focus is around house No 7 and 8 (refer map) where the husband of Boolokammal was said to have been an open case The brothers of this man living opposite are all of them simple neural cases Boolokammal herself is another open case Her son Devarajulu is an open case Just opposite where the brothers in law of Boolokammal live another girl Sampoornam aged fourteen years is also an open case Her father as stated earlier is a simple neural case This whole family constitutes a group of cases From Boolokammal infection seems to have spread to No 7 and 7a houses which are just at the back within easy approach There are two other open cases in houses No 4 and 5 which are also easily accessible to houses No 7 and 8 as will be seen from the map All other cases are around these three foci The whole village is said to be interrelated



**Practice of Isolation**

Obviously bad cases seem to be isolated food is given to them separately. For instance Narayanaswami Chetty and his son Peddappa in house No 30 live in isolation in a separate hut at the back yard

**Local Conditions Affecting Spread of Leprosy**

It is said that this village is isolated by the neighbouring villages for fear of leprosy. Children from houses with leprosy are said to be admitted with difficulty into village schools This has resulted in an attempt on the part of the parents to hide boys of school age going for examination When found it was requested that the knowledge be kept secret The opinion of the neighbouring villages is that Mottur is full of leprosy so much so that people fear to go into the village Possibly this story is purposely spread as a cover for the illicit distillation of arrack

**Indigenous Method of Treating Tuberculoid Leprosy**

A leaf is ground and applied over the lesion in the form of a paste It appears to be caustic in nature Actually this was seen being applied on two of the children examined The edges of the lesion showed evidence of irritation and ulceration There were other cases of a similar nature

SURVEY TYPE I

SCHEDULE I

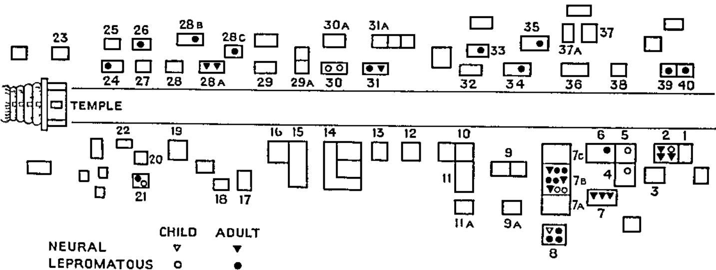
*District* North Arcot *Taluk* *Village* Mottur

| Total Population | Cases Detected | | | | Incidence per thousand |
|---|---|---|---|---|---|
| | Sex | Neural | Lepromatous | Total | |
| 168 | Males | 17 | 9 | 26 | 124 |
| 146 | Females | 12 | 1 | 13 | |
| 314 | Total | 29 | 10 | 39 | |

ANALYSIS OF CASES BY TYPE AND AGE

| Age Group | Cases | | | | Total for Age Group | Percentage of Total Cases |
|---|---|---|---|---|---|---|
| | Neural | | Lepromatous | | | |
| | No | Percentage | No | Percentage | | |
| 0–14 | 12 | 92 3 | 1 | 7 7 | 13 (M 9 F 4) | 33 3 |
| 15–34 | 4 | 50 0 | 4 | 50 0 | 8 | 20 6 |
| Over 34 | 13 | 72 2 | 5 | 27 8 | 18 | 46 1 |
| Total | 29 | 74 4[1] | 10 | 25 6[1] | 39 | 100 0 |

[1] The percentages indicate the proportion of N and L cases.


PLAN OF (KALAMPTU) MOTTUR VILLAGE GUDIYATHAM TALUK N A DT
TEMPLE
1
2
3
4
5
6
7
7A
7B
7C
8
9
9A
10
11
11A
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
28A
28B
28C
29
29A
30
30A
31
31A
32
33
34
35
36
37
37A
38
39
40
CHILD
ADULT
NEURAL
LEPROMATOUS

| Serial No | Door No | Name | Sex | Age | Caste | Type of Disease and Remarks |
|---|---|---|---|---|---|---|
| 1 | 1 | Muniratnam | Mc | 15 | Chetty | ? N1 Ns (suspicious) |
| 2 | | Dhanabal | Mc | 13 | | ? N1 Nt (suspicious) |
| 3 | 2 | Govinda Naidu | M | 35 | | L2 |
| 4 | | Gopal | Mc | 12 | | N1 Incipient |
| 5 | | Chakrapani | Mc | 13 | | N1 Ns |
| 6 | | Mohanraj *alias* Chinnappa | Mc | 8 | | N1 Ns |
| 7 | 4 | Chinnaswamy | M | 21 | | L1 |
| 8 | 5 | Chillakandan | M | 16 | | L1 |
| 9 | 6 | Papiah Naidu | M | 45 | | N2 Ns |
| 10 | 7 | Govindan | Mc | 10 | | N1 Nt |
| 11 | | Muniratnam | Mc | 10 | | N1 Ns |
| 12 | | Adilakshmi | Fc | 7 | | N1 Nt |
| 13 | | Ellammal | F | 70 | | N1 Nt (not verified) |
| 14 | 7B | Govindaraja | Mc | 7 | | N1 Nt |
| 15 | | Govinda Naidu | M | 50 | | N2 Nt |
| 16 | | Rajammal | F | 35 | | N2 Ns |
| 17 | | Sriramalu | Mc | 15 | | N1 Ns |
| 18 | | Hamsa | Fc | 8 | | N1 Nt |
| 19 | | Chinnappa ammal | F | 35 | | N1 Nt |
| 20 | | Boolokammal | F | 38 | | L1 (husband died open case) |
| 21 | | Devarajan | M | 18 | | L1 |
| 22 | | Kannan | Mc | 8 | | N1 Nt Major |
| 23 | 8B | Sampoornam | Fc | 14 | | L1 |
| 24 | | Babulu Naidu | M | 43 | | N2 Ns |
| 25 | | Srinivasan | M | 33 | | N1 Ns |
| 26 | | Kuppuswami Naidu | M | 50 | | N1 Ns |
| 27 | 18 | Rajammal | F | 23 | | N1 N (not verified) |
| 28 | 21 | Lakshmi | F | 37 | | N1 Nt Major |
| 29 | | Mayan | M | Adult | | L1 |
| 30 | 24 | Gangammal | F | 43 | | N1 Nt Major |
| 31 | 26 | Ellammal | F | 73 | | N1 Nt |
| 32 | 27 | Pattabi | M | Adult | | N1 Nt (not verified) |
| 33 | 28A | Chakrapani | Mc | 7 | | N1 Ns |
| 34 | | Sakunthala | Fc | 8 | | N1 Nt |
| 35 | 28B | Chinnappan | M | 23 | | N1 Ns |
| 36 | | Varadaan | M | 20 | | ? N1 Ns (suspicious) |
| 37 | 28C | Krishnan | M | 19 | | N1 Ns |
| 38 | 30 | Narayanasami Chetty | M | 58 | | L2 N3 |
| 39 | | Yeddappa | M | 23 | | L2 |
| 40 | 31 | Chellammal | F | 41 | | N1 Ns |
| 41 | | Muthialu | Mc | 10 | | N1 Ns |
| 42 | 33 | Abboy Naidu | M | 37 | | N1 Ns |
| 43 | 34 | Lakshmanammal | F | 70 | | N1 Ns |
| 44 | 35 | Chinnammal | F | 38 | | N1 Ns |
| 45 | 39 | Kanthammal | F | 22 | | N1 Ns |
| 46 | 40 | Perriswamy | M | 29 | | N1 Ns |

## Remarks of Hon Director Leprosy Campaign on Verification of Cases in the Village

No 1 and 12 taken as suspicious because of the absence of definite signs though strongly suggestive in view of the leprosy history in the family

No 4 Studying at Vellore Absent from village Not verified not included in the statistics

No 13 Not verified owing to absence from village Reported by Dr Sarma as a definite N1 Ne case (retrogressed) Not included in the statistics

No 16 17 and 18 Absent from village but appear to be definite cases since they are taking treatment in the Vellore Mission Leadside Hospital Car along with father of No 15 These are included in the statistics

No 21 Not verified Absent Reported to be definitely L1 by Dr Sarma I am inclined to think it is a definite L1 since the mother is an open case And Dr Sarma has little doubt about the case

No 27 Not verified Not included in the statistics

No 9 Reported to have left for Chingleput Seeking admission Obviously an L1 case Included in the statistics

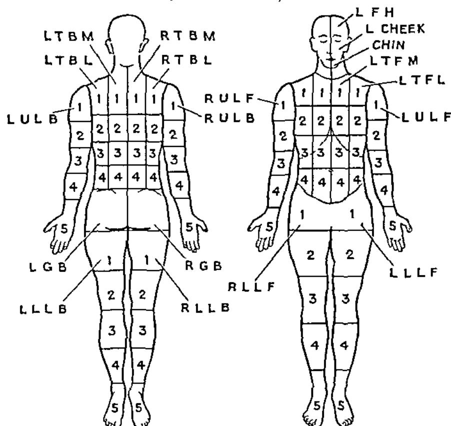
No 37 Absent from village not verified not included in the statistics

No 36 Typically suspicious patch but no definite signs hence included in the suspicious category

No 46 Appears to be an N1 Ns case but it is reported that the case was examined at the Vellore Mission Hospital and smears found to be positive for bacilli hence taken as L1

## APPENDIX III

DIAGRAMMATIC METHOD OF RECORDING INTRADERMAL INJECTIONS ON THE BODY THAT THE PHYSICIAN CAN SEE AT A GLANCE THE EXACT POSITION OF THE PREVIO INTRADERMAL INJECTION (*MUIR S METHOD*)




The front and back of the body is divided into four areas as follows

L T B M
equivalent to left trunk back middle
R T B M
equivalent to right trunk back middle
L T F M
equivalent to left trunk *front middle*
R T F M
equivalent to right trunk front middle
L T B L
equivalent to left trunk back lateral
R T B L
*equivalent to right trunk* back lateral

These areas are then numbered down the body 1 2 3 and 4

Similarly the arms and legs are divided into five areas as follows

L U L B
equivalent to left upper limb back
1 2 3 4 5

L U L F
equivalent to left upper limb front
1 2 3 4 5

R L L F
equivalent to right lower limb front
1 2 3 4 5

L L L F
equivalent to left lower limb front
1 2 3 4 5

Areas of the face are indicated as follows

L F H
equivalent to left forehead

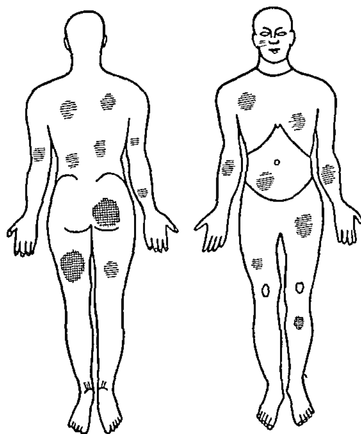
R F H
equivalent to right forehead

Right cheek right chin and so on

When a patient comes for his injection the physician marks with a slim pencil the place on the body to be injected and records this area according to the symbols described above

## APPENDIX IV

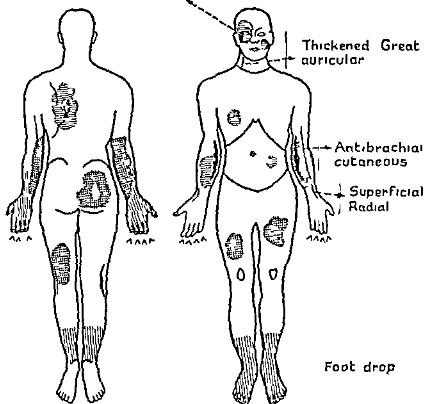
### 1 DIAGRAMMATIC REPRESENTATION OF LESIONS IN SIMPLE MACULAR LEPROSY (NEURAL TYPE)—$N_1NS$



Hypopigmented macule and definite margin

Simple hypopigmented macule anaesthetic

2 DIAGRAMMATIC REPRESENTATION IN LESIONS OF NEURAL TUBERCULOID LEPROSY (MAJOR)—$N_2NT$




Infiltrated erythematous raised anaesthetic circumscribed macule

Superficial cutaneous nerves going into macule

Ulcerated centre — Reactive phase

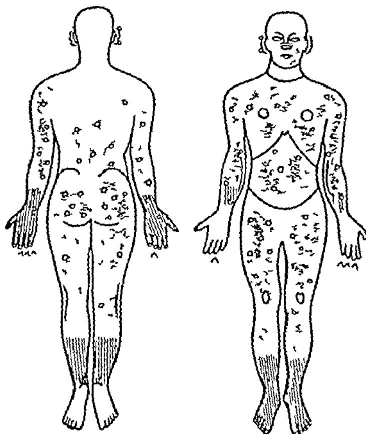
Apparently normal area in the centre of a major Tuberculoid macule

Desquamating exfoliative or Scaly macule Reactive phase

Nerve abscess

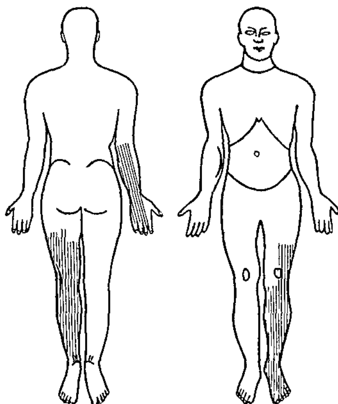
Saccular irregular nerve thickenings

## 3 DIAGRAMMATIC REPRESENTATION OF ADVANCED LEPROMATOUS LEPROSY—$L_3N_2$



{ Thick infiltration Ears
ʆ Nodules Ears
Ö Depressed bridge of nose
O Gynecomastia
∘ Small Nodule
o Large sub-cutaneous nodule
^^ Contractures Fingers

4 DIAGRAMMATIC REPRESENTATION OF LESIONS OF NEURAL ANAESTHETIC LEPROSY—$N_1Na$



) Thickening of nerve ulnar & peroneal

||||| Anaesthesia

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